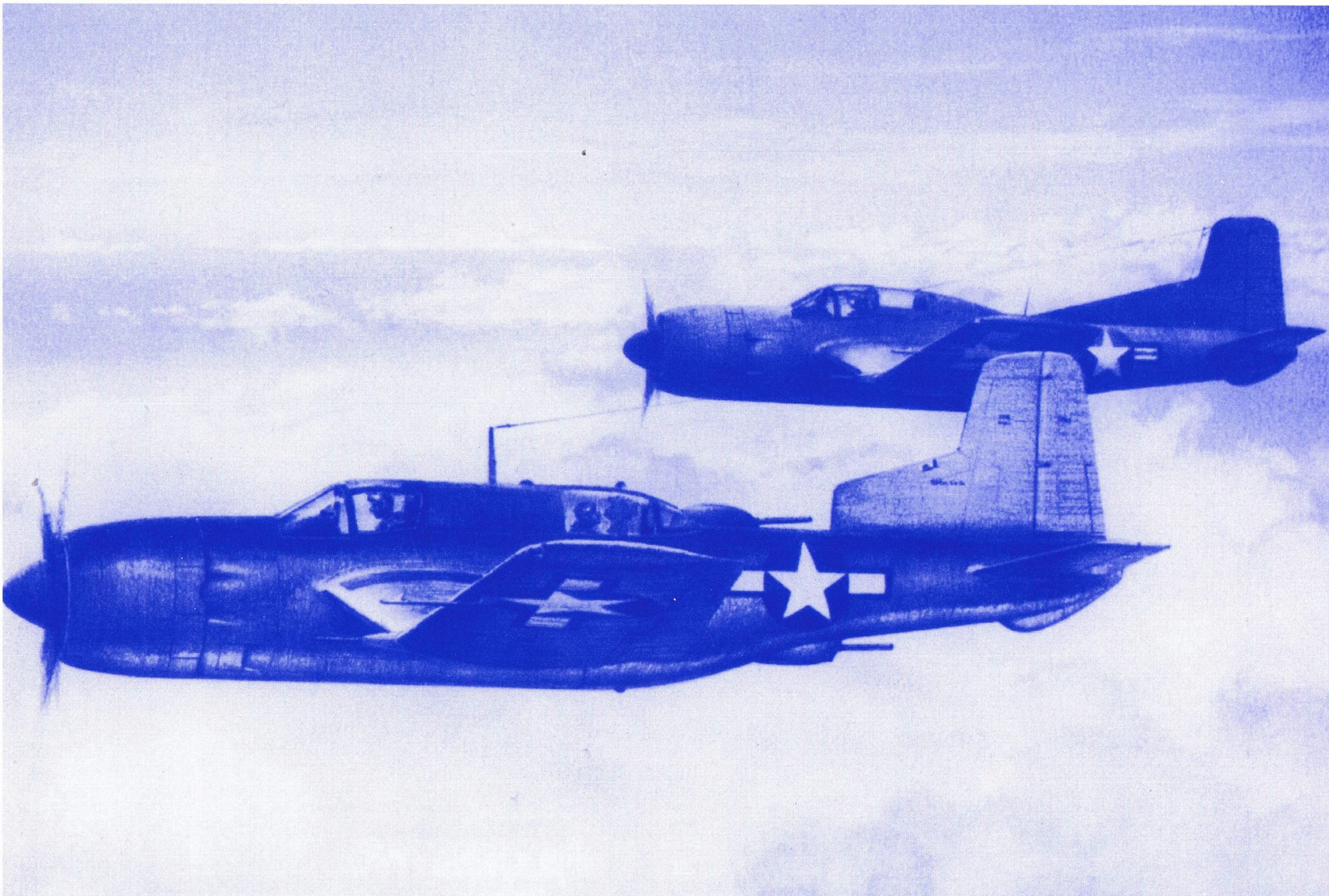
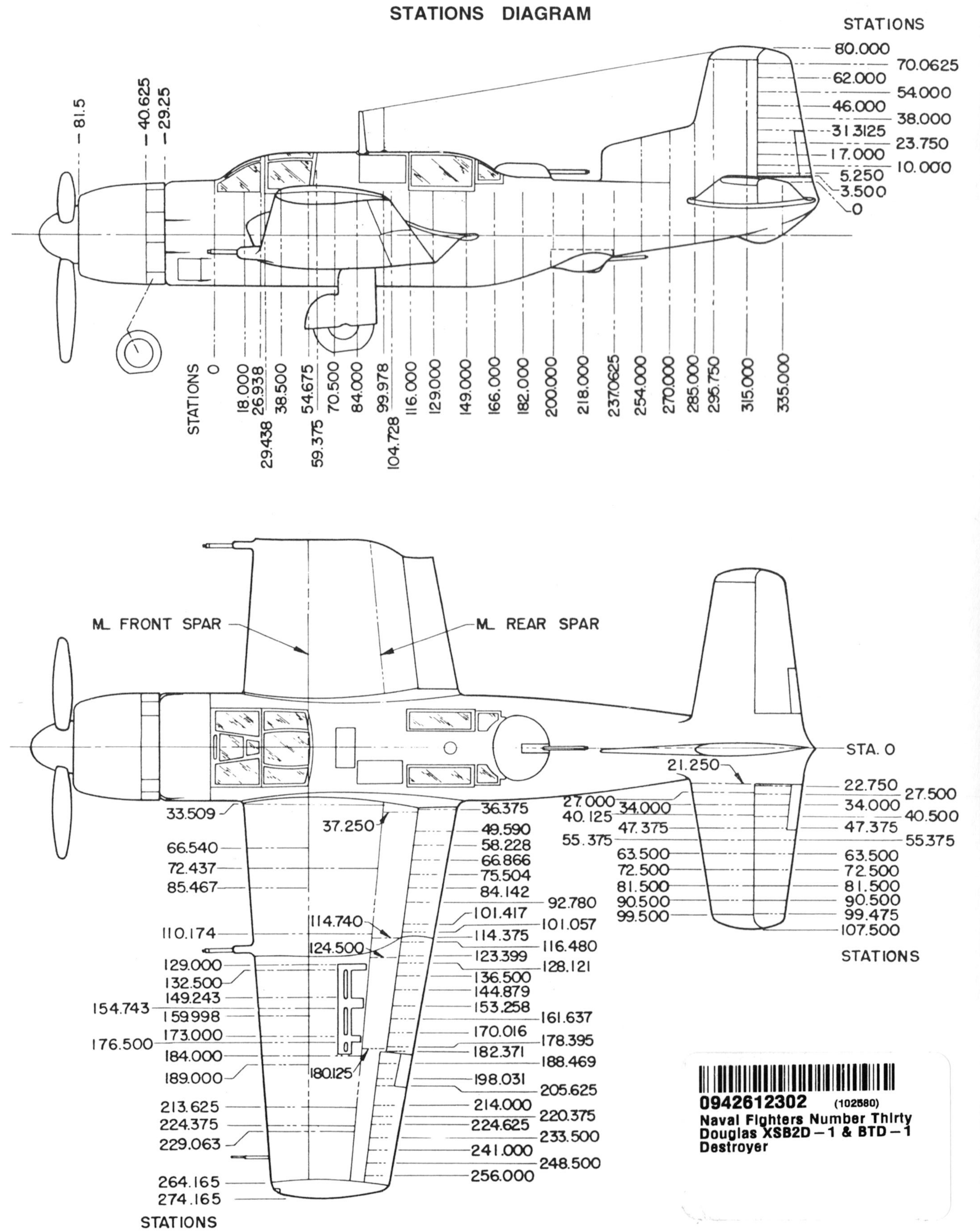
NAVAL FIGHTERS NUMBER THIRTY

DOUGLAS XSB2D-1 & BTD-1 DESTROYER



BY BOB KOWALSKI AND STEVE GINTER



Front cover, Douglas publicity artwork of XSB2D-1 and BTD-1 Destroyer in flight together. (R. G. Smith via Harry Gann)

DOUGLAS XSB2D-1 AND BTD-1 "DESTROYER"

INTRODUCTION

Bob Kowalski continues the saga of the Bomber Torpedo (BT) program and the similar Scout Bomber (SB) program with the obscure story of the Douglas XSB2D-1 and BTD-1 "Destroyer". The story started in Naval Fighters Number Twenty-Four, Martin AM-1/-1Q Mauler. It is our intention to cover all the other unique and interesting aircraft fostered by these programs in future issues of Naval Fighters. These include the Kaiser-Fleetwings XBTK-1, Curtis-Wright XBTC-2 and XBT2C-1, and the Douglas XTB2D-1 "Sky Pirate".

This book would not have been possible without the generous support of Harry Gann and Douglas Aircraft Division from which most material for this book was obtained.

Anyone having photos or other information on this, or any other naval or marine aircraft, may submit them for possible inclusion in future issues. Any material submitted will become the property of NAVAL FIGHTERS unless prior arrangement is made. Individuals are responsible for security clearance of any material before submission.

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BACKGROUND

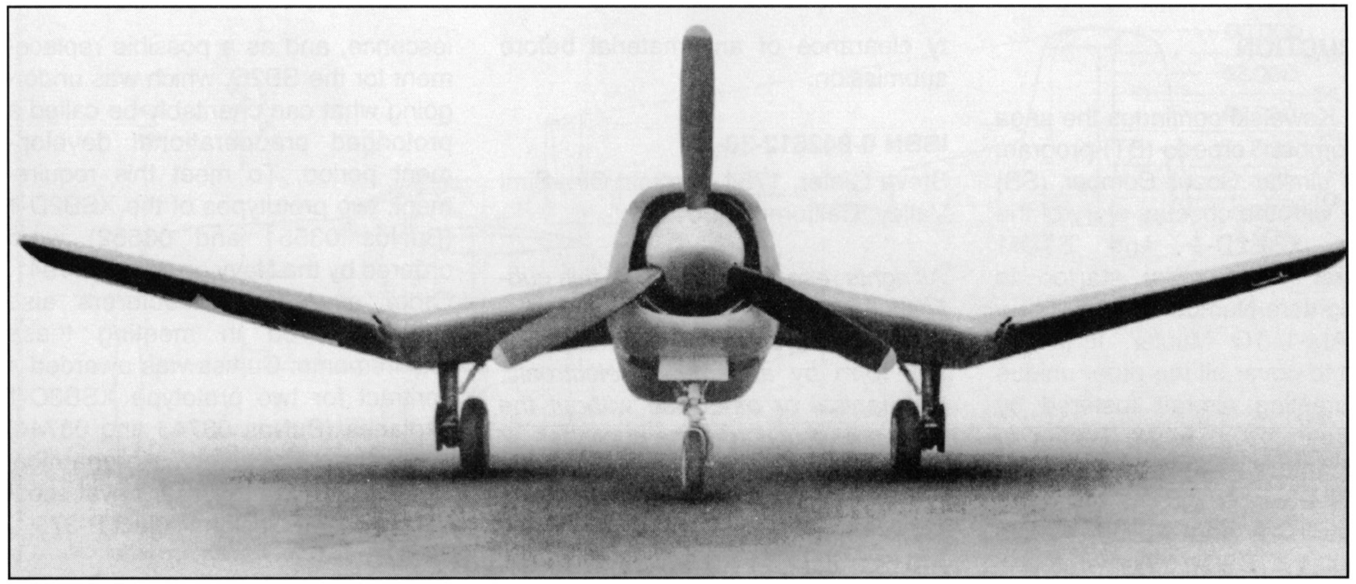
The United States was still at peace when the Navy issued a requirement for a design to serve with the fleet as both a successor to the SBD, which would be nearing obsolescence, and as a possible replacement for the SB2C, which was undergoing what can charitably be called a prolonged preoperational development period. To meet this requirement, two prototypes of the XSB2D-1 (BuNos 03551 and 03552) were ordered by the Navy on 30 June 1941. Other aircraft manufacturers also were involved in meeting these requirements: Curtiss was awarded a contract for two prototype XSB3C-1 airplanes (BuNos 03743 and 03744) and the Brewster Aeronautical Corporation had a similar naval scout bomber, their Design Project P-37.

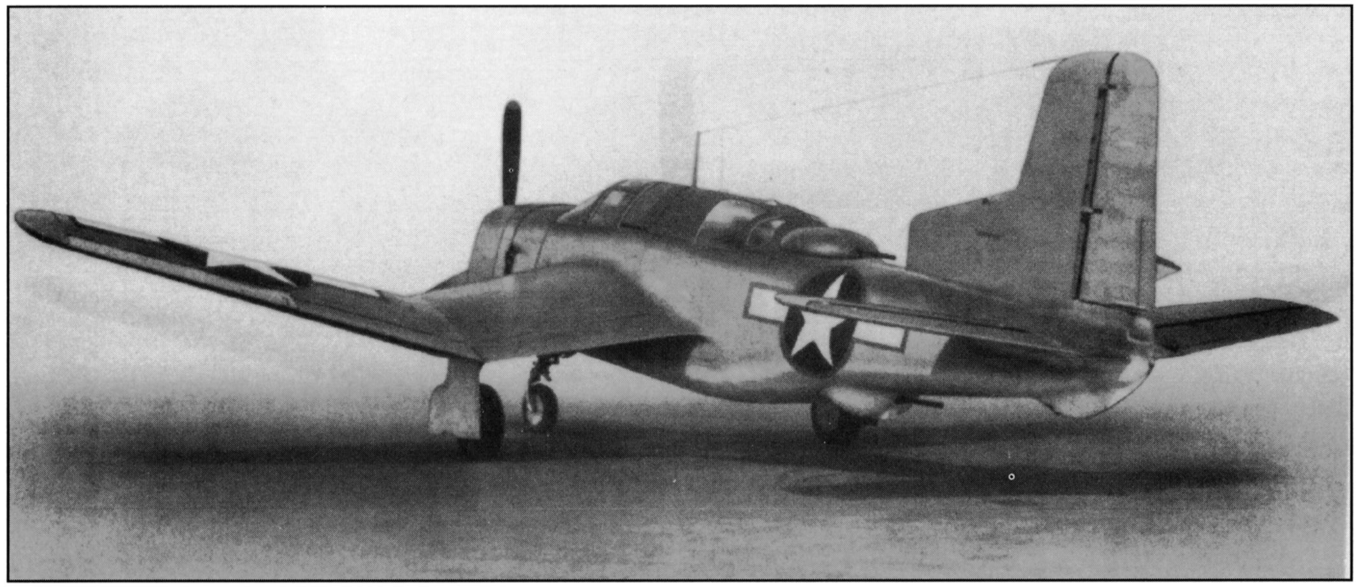
XSB2D-1

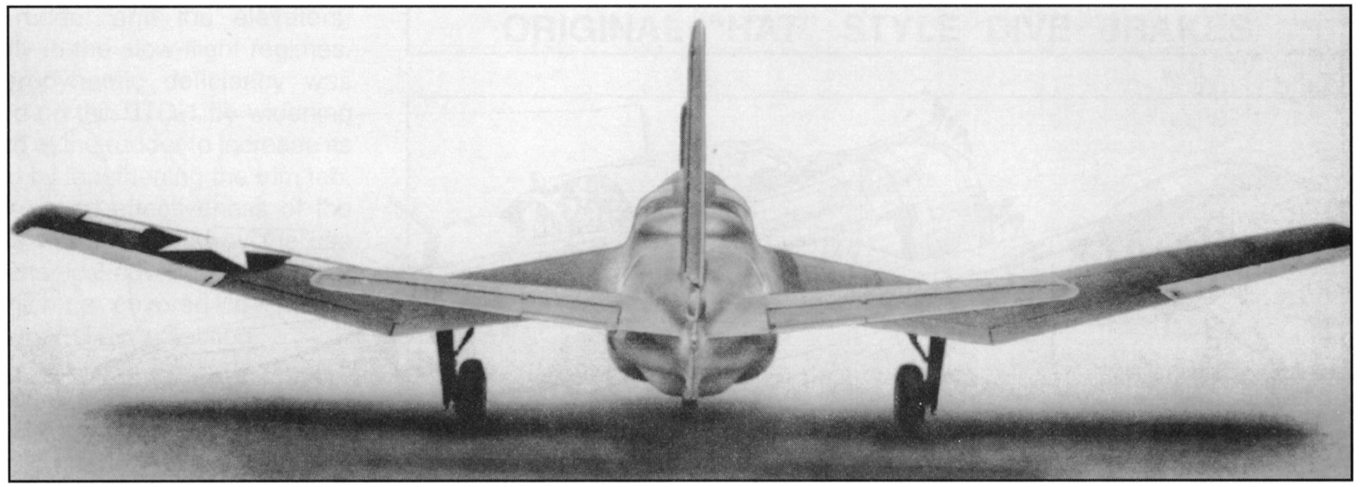
Conforming to the pre-World War Two thinking about self-defense, this design was to be a two-seat airplane manned by a pilot and a rear-seat gunner who operated two remote controlled gun turrets. However, the other design requirements were farsighted and showed how intently the Navy (BuAer) was planning for the upcom-

XSB2D-1 touching down. Wing cannons and turret guns are not installed. (MFR)

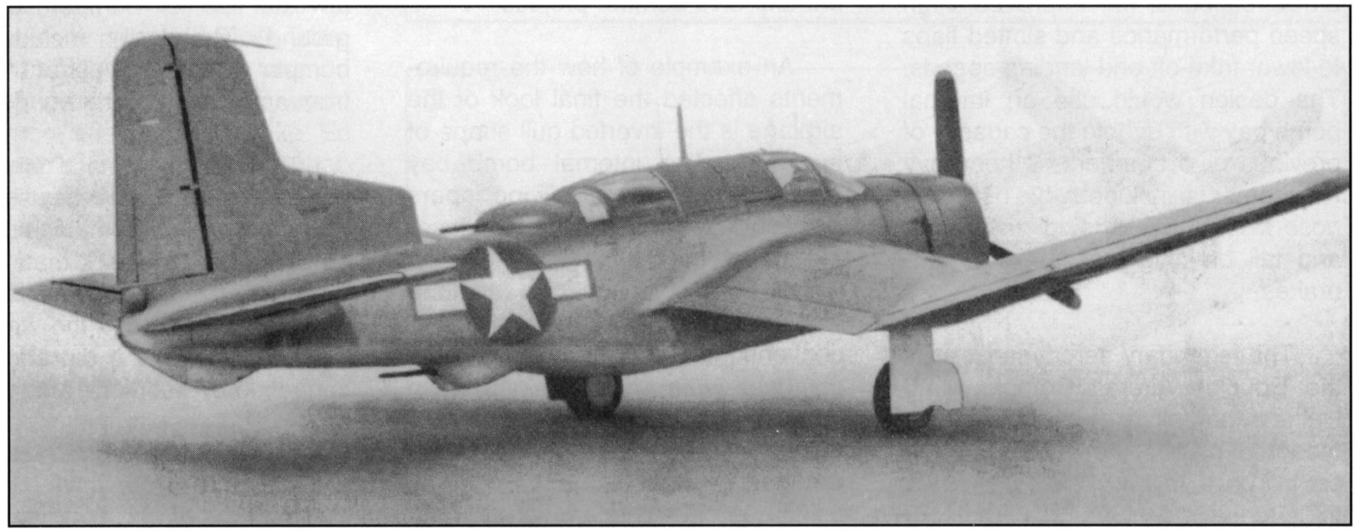
XSB2D-1 WALK-AROUND

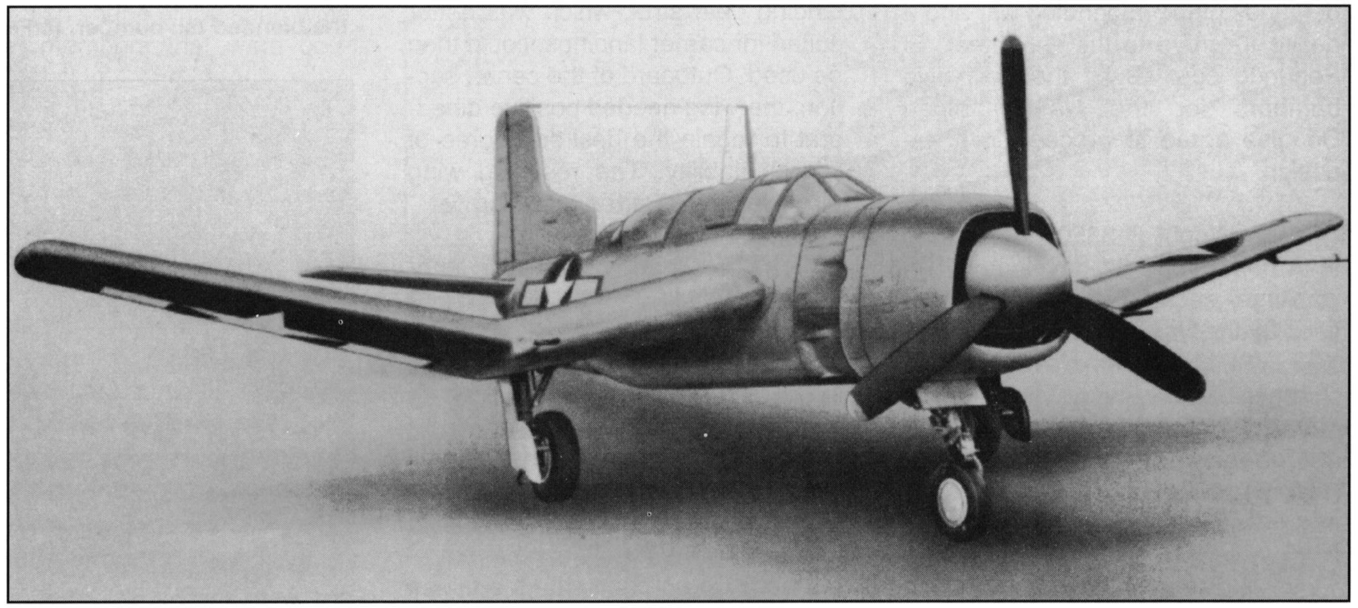


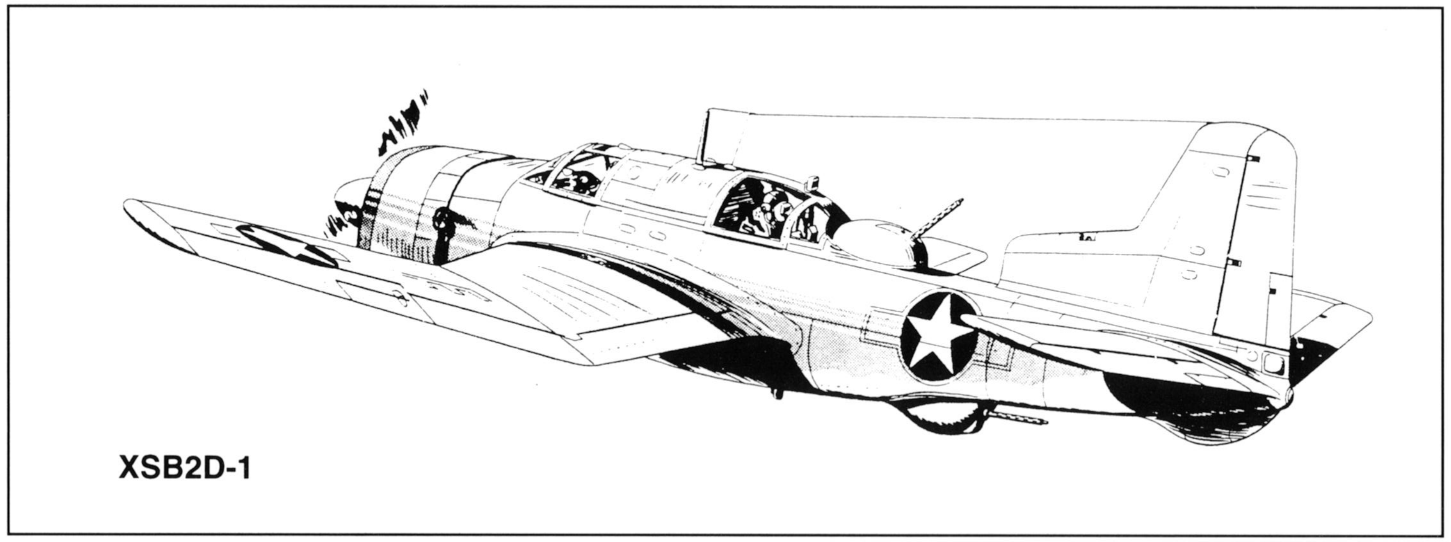




These six views of the XSB2D-1 illustrate its nose high stance, gull wing and unusual cowl and prop spinner. At the end of the war there were only three carrier aircraft built with tricycle landing gear. These were the Grumman F7F "Tigercat", the Ryan FR-1 "Fireball", and the Douglas XSB2D-1 and BTD-1 "Destroyer". The national insignia on the XSB2D-1 was bordered by red in these 1943 photos. The aircraft sported the tri-color scheme of sea blue on the upper fuselage and beneath the wings outboard of the wing fold, with intermediate blue used on the fuselage sides and upper wings, and white undersurfaces. (MFR)







ing war.The design specified the Wright R-3350-14 engine, a new engine type then rated at 2,000 HP. The Navy specifications also called for a wing that utilized laminar flow airfoil sections for improved high speed performance and slotted flaps to lower take-off and landing speeds. The design would use an internal bomb bay with double the capacity of previous dive bombers. Other Navy requirements included the use of a nose-wheel type landing gear, wing and tail de-icing systems and dive brakes.

The legendary aerodynamicist of the Douglas Aircraft Company, Ed Heinemann felt these requirements meant a design that would be too complicated to be handled by both the aircrew and maintenance personnel with ease. However, the demands of the impending war and a desire to prove to the Navy that "El Segundo could build the best dive bombers for the Navy" helped Douglas agree to proceed with the design.

The Wright R-3350 engine was then undergoing its development in war-time secrecy. Although being used by the Navy to power the Martin XPB2M-1 Mars (see Naval Fighters Number Twenty-nine, The Martin Mars), it first reached full scale production use in the Boeing B-29 program of 1942. Ed Heinemann preferred to use the Pratt & Whitney R-2800 because it was a smaller and lighter engine than the R-3350, which was "too big for what we had in mind". The difference of opinion between the Navy and Ed Heinemann about how much engine was needed would occur again on another dive bomber project.

An example of how the requirements affected the final look of the airplane is the inverted gull shape of the wing. The internal bomb bay meant that the main wing spars would have to pass through the fuselage above the internal bomb bay. To satisfy that condition, the airplane would be a mid-wing design. If the conventional form of positive wing dihederal was used, a long main landing gear strut (as on the SB2C) would be needed to meet the required ground clearance. But by using negative dihederal for the center section of the wing, a shorter landing gear strut, which was better suited for carrier landings, could then be used. Outboard of the center section, the wing needed positive dihederal to regain the desired degree of lateral stability. The resulting wing form was the inverted gull wing.

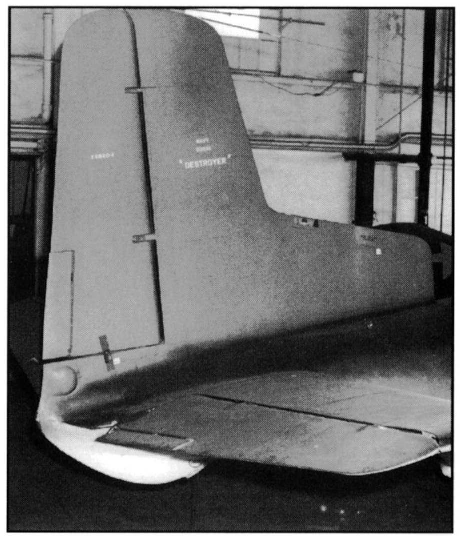
The prescribed nose-wheel landing gear would improve the ground handling characteristics during take-off and landings, but to pilots trained in the "three-point landing", it meant a rethinking of their landing technique. To that end the Pilot's Handbook cautions: "The airplane should be flown onto the ground; a full-stall landing must not be attempted" and "Do not land with the tail so

Artist rendition of the XSB2D-1 in flight. Note location of the radio antennae mast as compared to the photo on page one. (MFR)

low that the tail bumper strikes the ground". The design included a tail bumper to absorb most of the stress from any inadvertent ground contact.

The use of a nose wheel also meant that the main wheels (and the wing that carried them) would have to be placed further back than on a tail wheel configured airplane. This was necessary to change the weight distribution, however it did shorten the control force moment arm. That, in turn, would lessen the effectiveness

Close up of the XSB2D-1 tail on BuNo 03551 on 7-3-43. Note the navigational light located in the tail's dorsal fin and the blended tail bumper. (MFR)



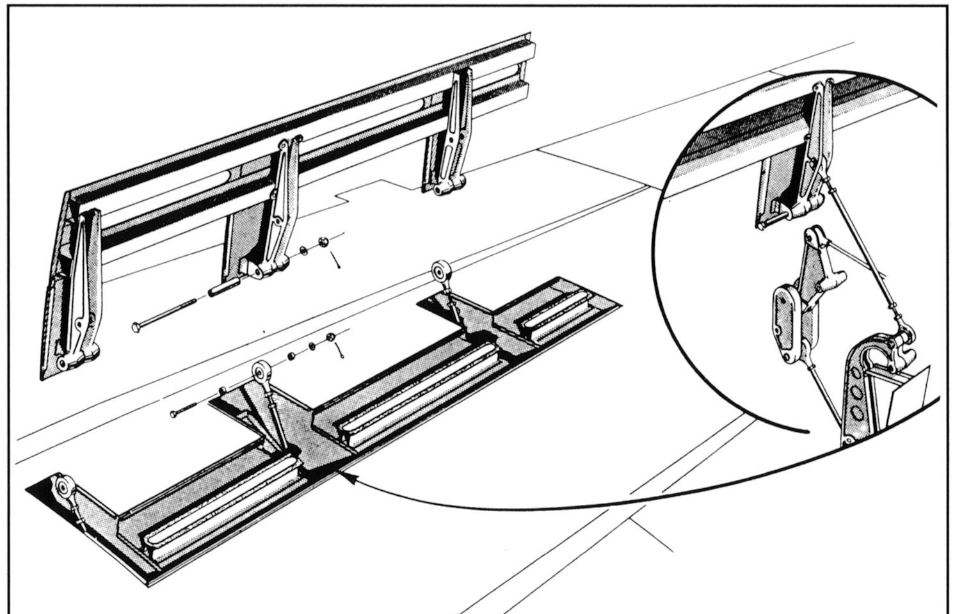
of the rudder and the elevators, especially in the slow-flight regimes. This aerodynamic deficiency was corrected on the BTD-1 by widening the chord of the rudder to increase its area and by lengthening the trim tab. The low speed effectiveness of the elevators was increased by the use of a mechanical advantage shift system, which is covered in greater detail in the BTD-1's section.

Although the laminar flow airfoil promised the aircraft designer many benefits, it needed an uninterrupted airflow over its surfaces, to provide those benefits. A wing mounted dive brake with its features of perforations, panel joints, etc., would interrupt the boundary layer airflow negating the benefits of the laminar airfoil. Because the XSB2D-1 would be heavier than previous dive bombers, and the Navy still required zero-lift in a ninety-degree dive (roughly translated, no pitch change as the airspeed increased), it would need a more effective dive brake. Ed Heinemann's original feeling that, "the dive brakes would have to be as big as the plane's wing to work properly", gives us some insight into the magnitude of this problem.

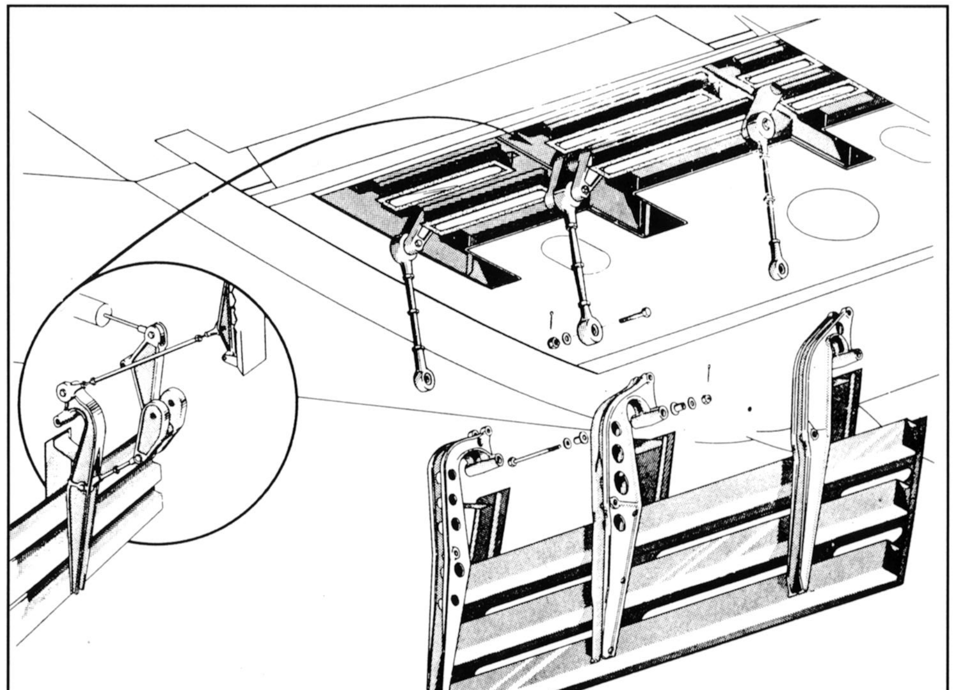
The Navy's requirement for slotted flaps had eliminated the option of using a combination wing-flap dive brake as used on the SBD. The first dive brake installed on the XSB2D-1 is referred to in the manuals as a "hat" type ("hat" seems to refer to the cross-section shape of the span-wise structural members that were covered by plating). The panels were installed on both the upper and lower surfaces of the outer wing and were hydraulically powered. To minimize the pitching moment that occurred while they were open, the panels operated in opposite directions. That was achieved by locating the panels' hinges at opposite ends, ie., the upper panels were hinged aft while the lower panels were hinged forward.

The next advancement in dive brake design was the modification of BuNo 03551 to include a combination fuselage-and-wing dive brake.

ORIGINAL "HAT" STYLE DIVE BRAKES



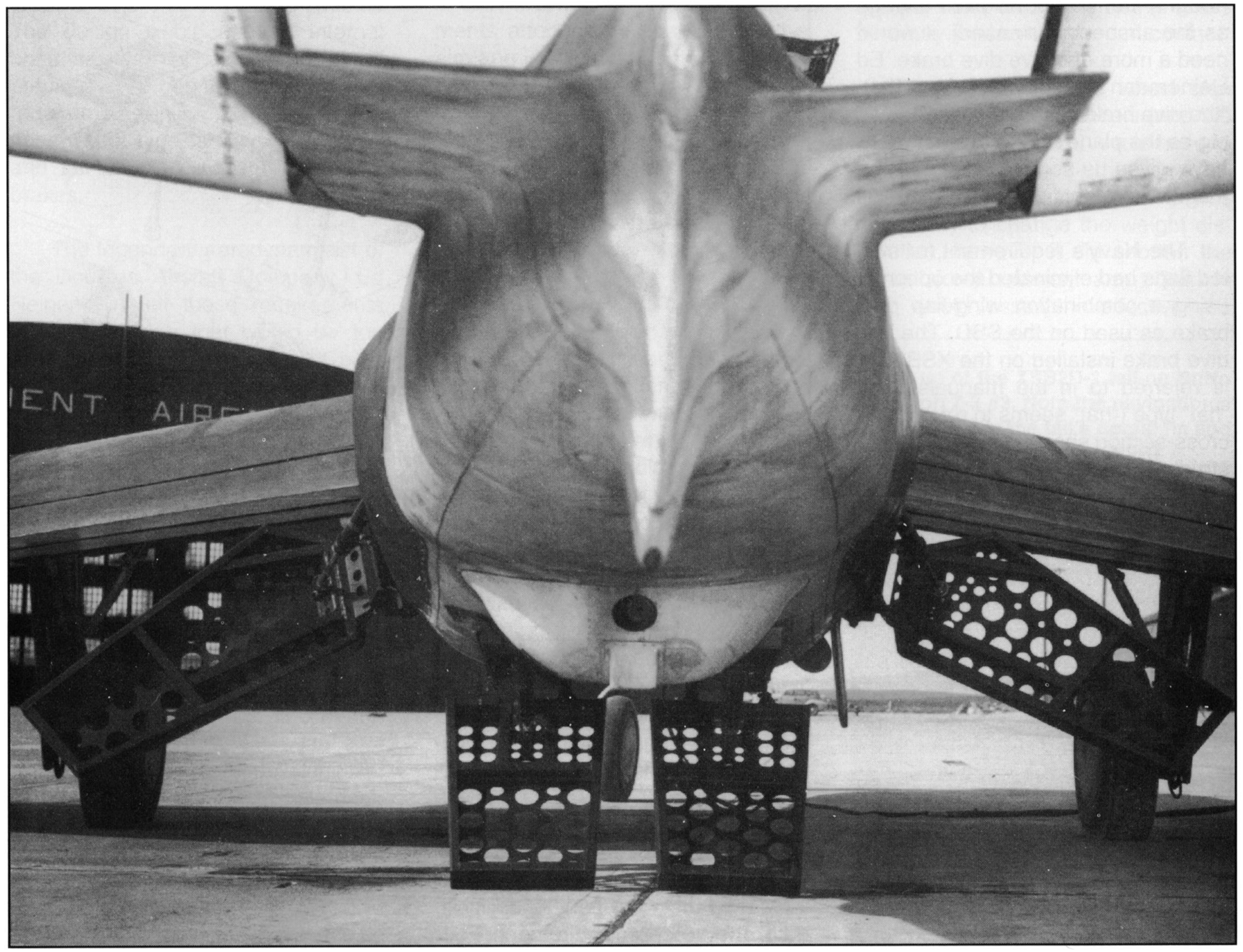
upper wing dive brakes



lower wing dive brakes

The wing panels were changed to a picket-fence type with a greater area than the previous hat type. The pickets were installed chord-wise, perhaps to lessen their interference with the laminar airflow. The placement of the lower panel hinge was moved further forward, which could have increased the wing panel's ability to meet the zero-lift requirement. Four fuselage dive brake panels were added onto the outside of the fuselage as a means of expediting the test installation. Apparently, a large degree of buffeting was anticipated, judging from the amount of perforations. This use of fuselage panels increased the total area of the dive brakes, thereby increasing their overall effectiveness.

Two views of XSB2D-1 03551 on 11-11-43 in the test configuration used on flights 78 through 84. The hat type wing dive brakes have been replaced with the picket fence wing dive brakes (seen above extended from the lower wing only), which would be standard on the BTD-1. The four fuselage dive brakes were temporary proof-of-concept units. They were constructed out of welded box steel tubing which was covered with perforated flat steel plate. Sheet metal enclosures were fabricated and added externally to the fuselage sides so that the dive brakes could be retracted into flush receptacles. The lower fuselage dive brakes, on the other hand, retracted flat against the belly of the aircraft thus adding drag to the fuselage in flight. (MFR)



The required bomb load was far-sighted and did much to contribute to that "rounded-square" look of the fuselage's underside. The space available for a bomb bay was limited to that which existed between the nose wheel well and the lower periscope, approximately eight feet. By making the bomb bay wider however, bombs could be carried side by side, parallel to the centerline of the airplane and resulting in that distinctive full-bellied shape. Each side had its own bomb-displacing gear to ensure that its bomb cleared the propeller's arc after being released during a steep dive. The bomb bay racks were designated as Right Hand or Left Hand and were designed to carry:

1 or 2-500 pound bombs, or
1 or 2-1000 pound General Purpose bombs, or
1 or 2-1600 pound Armor Piercing bombs, or
2 Mark 18 aircraft depth bombs (325 pounds each), or
2 Mark 5 Mod. 3 smoke tanks (975 pounds).

Two racks; installed on the wing's center section outboard of the main landing gear and could carry:

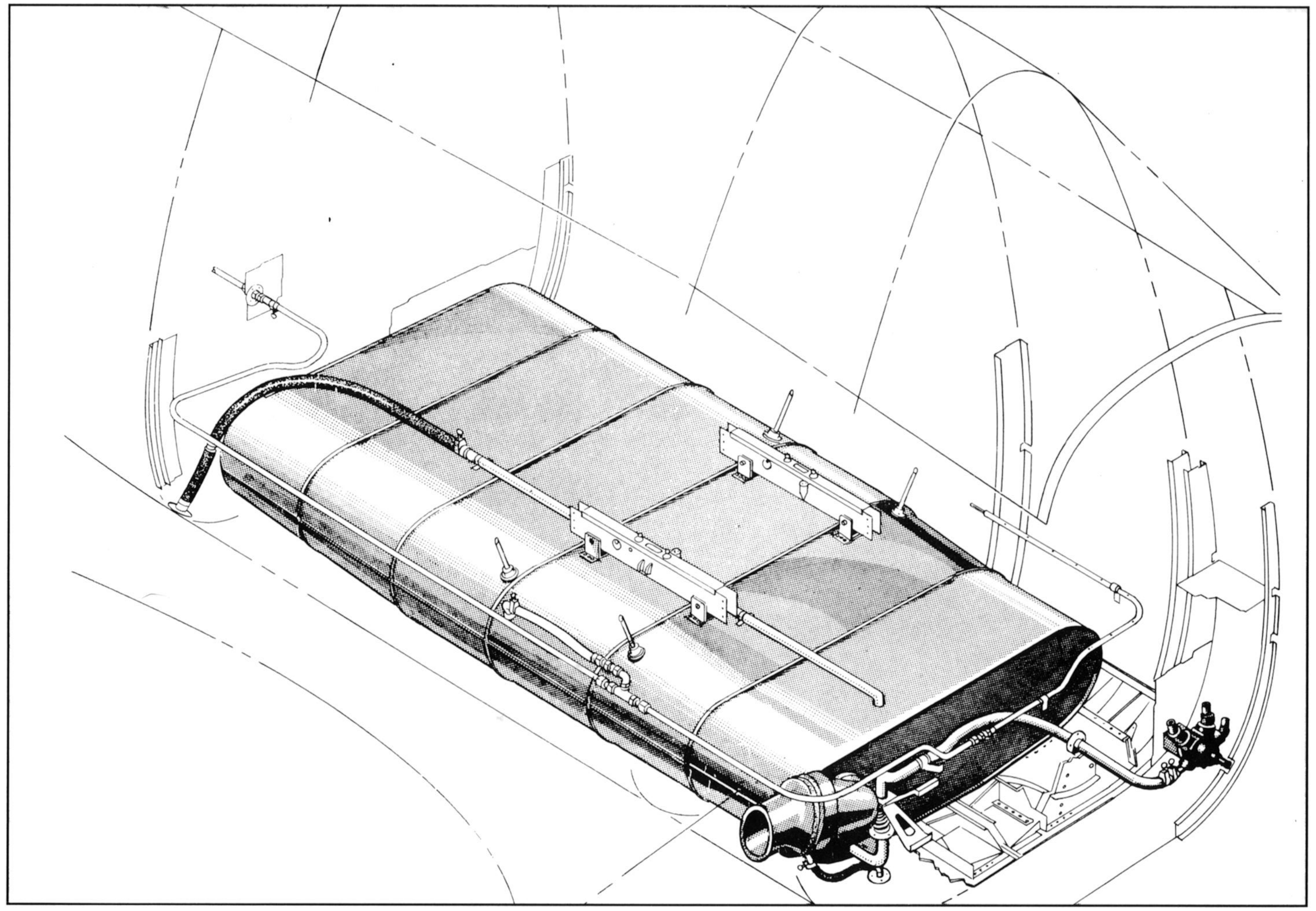
2-100 pound bombs, or
2 Mark 17 aircraft depth bombs (325 pounds each), or
2 Mark 7, Mod. 1 smoke tank (326 pounds).

When additional fuel was required for a scouting mission, the bomb bay could carry either a 77.5 gallon tank on the right hand side and a bomb on the left hand side, or a 200 gallon auxiliary fuel tank. Both auxiliary tanks were droppable and did extend the range of the scout bomber albeit at the expense of a reduced bomb load.

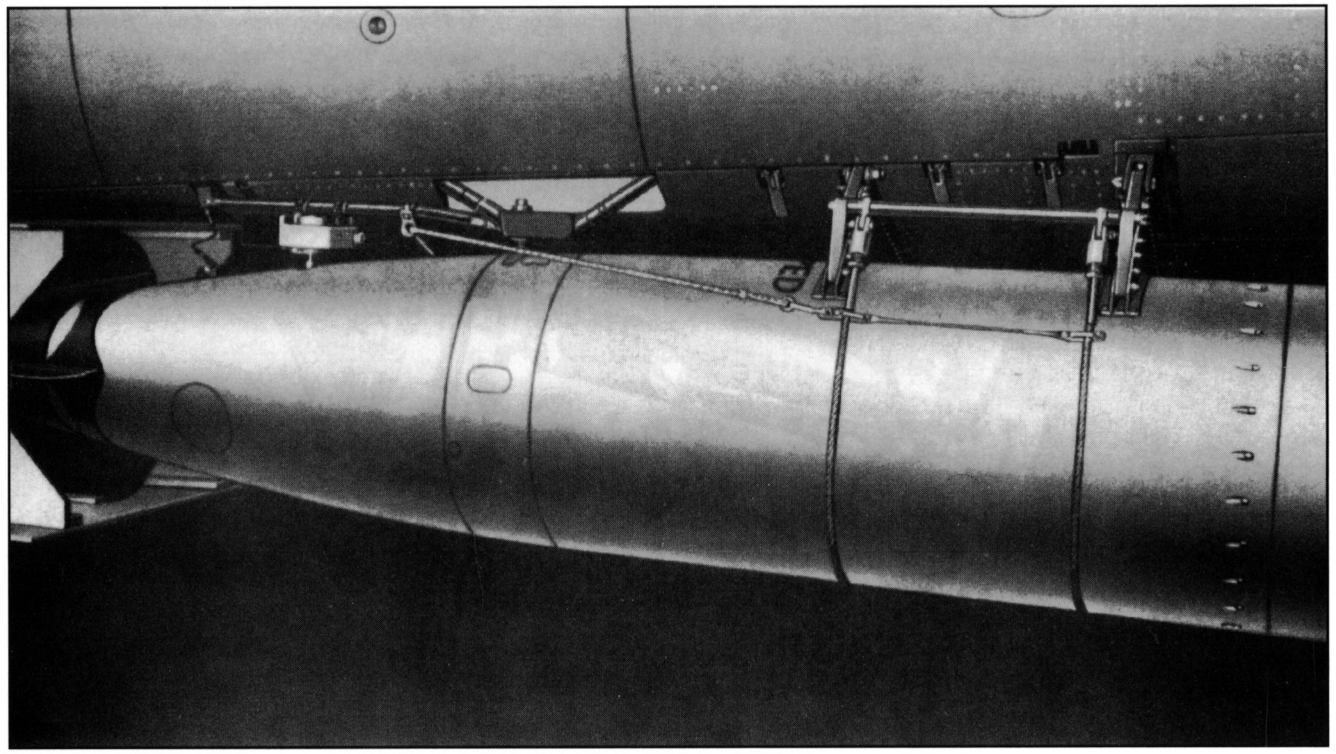
The Scout Bomber designation for the XSB2D-1 has served to hide another equally deadly mission from the aviation historian, and perhaps from the potential enemy of 1941. That mission was the one of a torpedo bomber when the XSB2D-1 would be armed with two torpedoes. The carriage of these torpedoes was considered to be an alternative installation which required the removal of the bomb bay doors and subsequent installation of the torpedo fairing. The torpedo sway braces and shackles were attached inside the bomb bay and extended through cut-outs in the fairing to complete the accommodation of the torpedoes.

Although the following table doesn't list all the possible ordnance loads that could be carried, it is included to show the extremes in these loads that the XSB2D-1 was designed to carry. Furthermore, because of the experimental status of the airplane this data, although accurate, was subject to change and shouldn't be considered definitive.

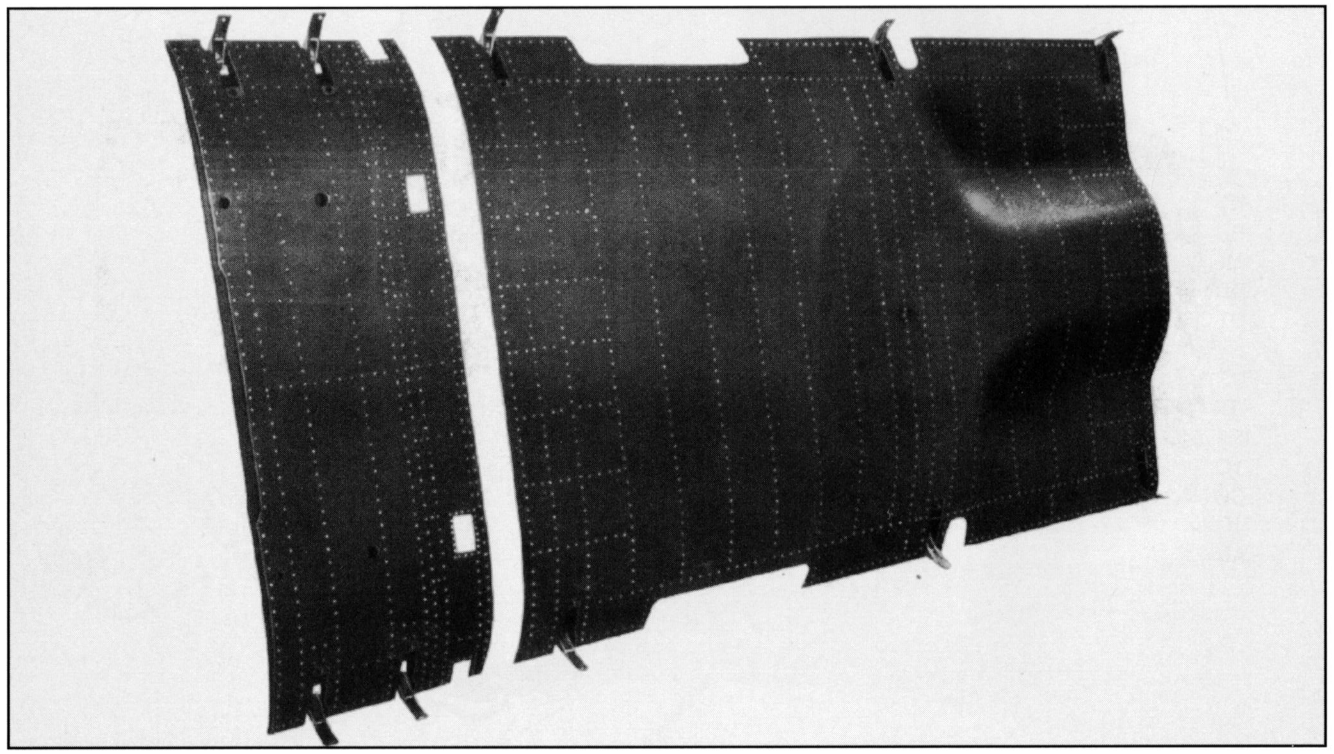
Large bomb bay fuel tank installed in the XSB2D-1. (MFR)



EXTERNAL TORPEDO INSTALLATION



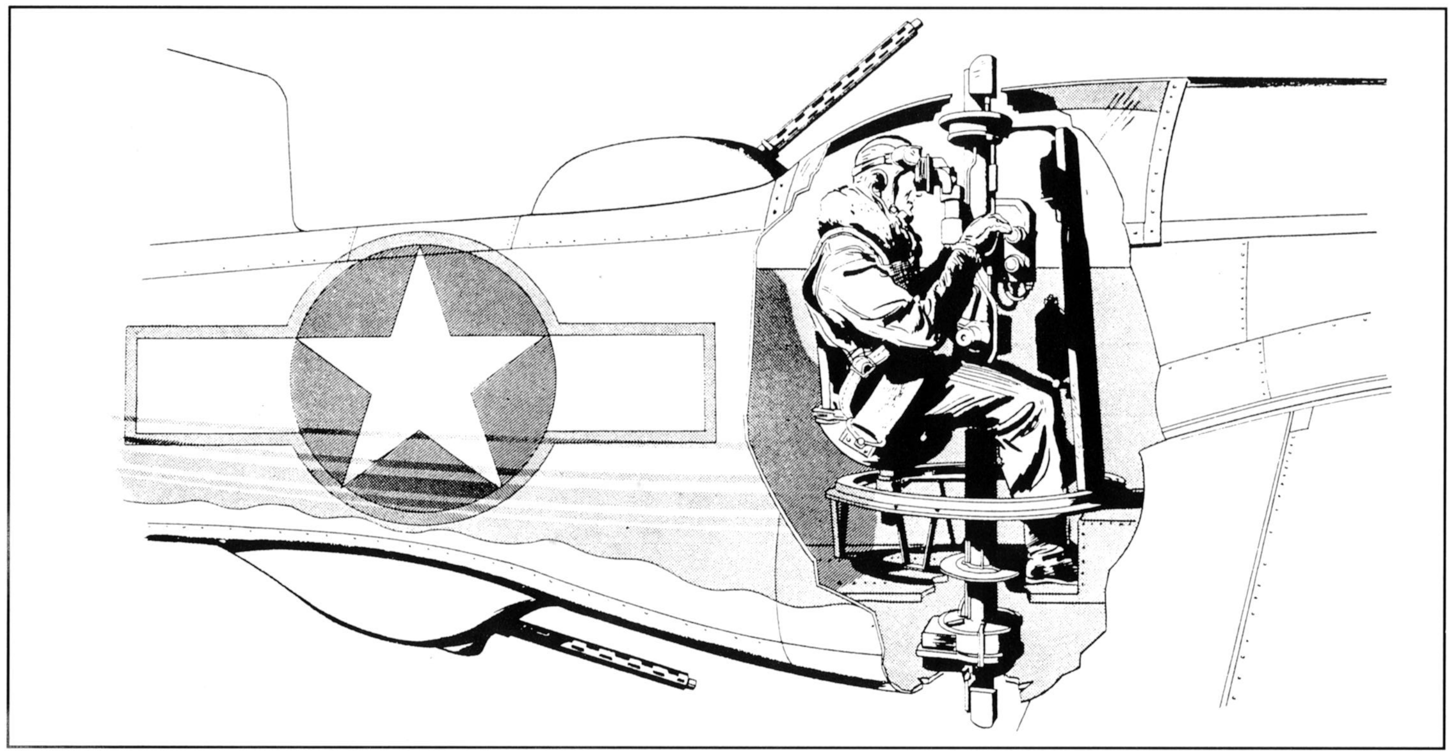
Above, torpedo shackle installation which enabled the XSB2D-1 and BTD-1 to carry two torpedoes externally. The shackles were attached internally and extended through the torpedo fairing (below) where they were connected to the torpedoes. To mount the fairings and the torpedoes, the bomb bay doors had to be removed from the aircraft. The torpedoes carried could be two 1,947 pound Mark 13-1 or two Mark 13-2 torpedoes attached to one Mark 4 bomb shackle installed on the inboard side of each torpedo sway brace. A Mark 30 combination torpedo director and gun sight was mounted on a bracket which extended forward through a cut-out in the upper center portion of the instrument panel. (MFR)

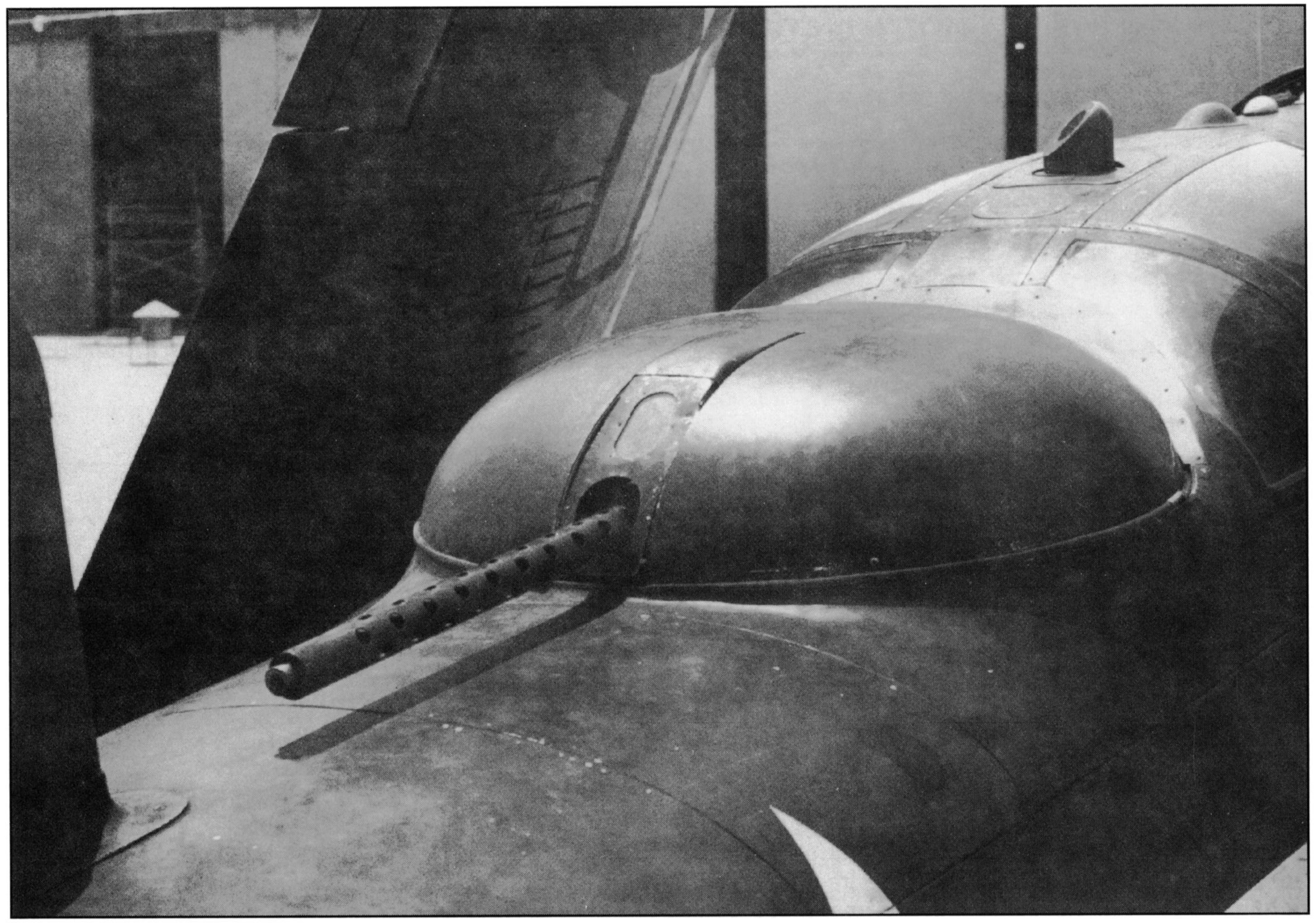


XSB2D-1 MISSION: BALANCE, 27.0% M.A.C.	OVERLOAD SCOUT BOMBER	2 1600 BOMBS DIVE BOMBER	2 TORPEDOES TORPEDO BOMBER
Basic Weight,			
Airframe plus crew:	14,246 lbs	14,246 lbs	14,274 lbs
Fuel Quantity (6 lbs / gal):	540 gal	223 gal	223 gal
1 Wing Tank, 110 gal	--------------	660 lbs	660 lbs
2 Wing Tanks, 220 gal	1,320 lbs	--------------	--------------
Fuselage Tank 113 gal	--------------	678 lbs	678 lbs
Fuselage Tank 120 gal	720 lbs	--------------	--------------
Fuselage Drop Tank 200 gal	1,200 lbs	--------------	--------------
Weight of Drop Tank	130 lbs	--------------	--------------
Engine Oil, 15 gal	-------------	112 lbs	112 lbs
Engine Oil, 31 gal	232 lbs	--------------	--------------
Armor Piercing Bombs:			
2-1,600 lb	-------------	3,200 lbs	--------------
Torpedoes:			
2-1,947 lb	-------------	--------------	3,894 lbs
Ammunition & Links	499 lbs	499 lbs	499 lbs
Signal Pistol & Float Lights	12 lbs	12 lbs	12 lbs
Gross Weight	18,359 lbs	19,407 lbs	20,129 lbs
Balance % M.A.C.	28.0%	30.0%	24.0%

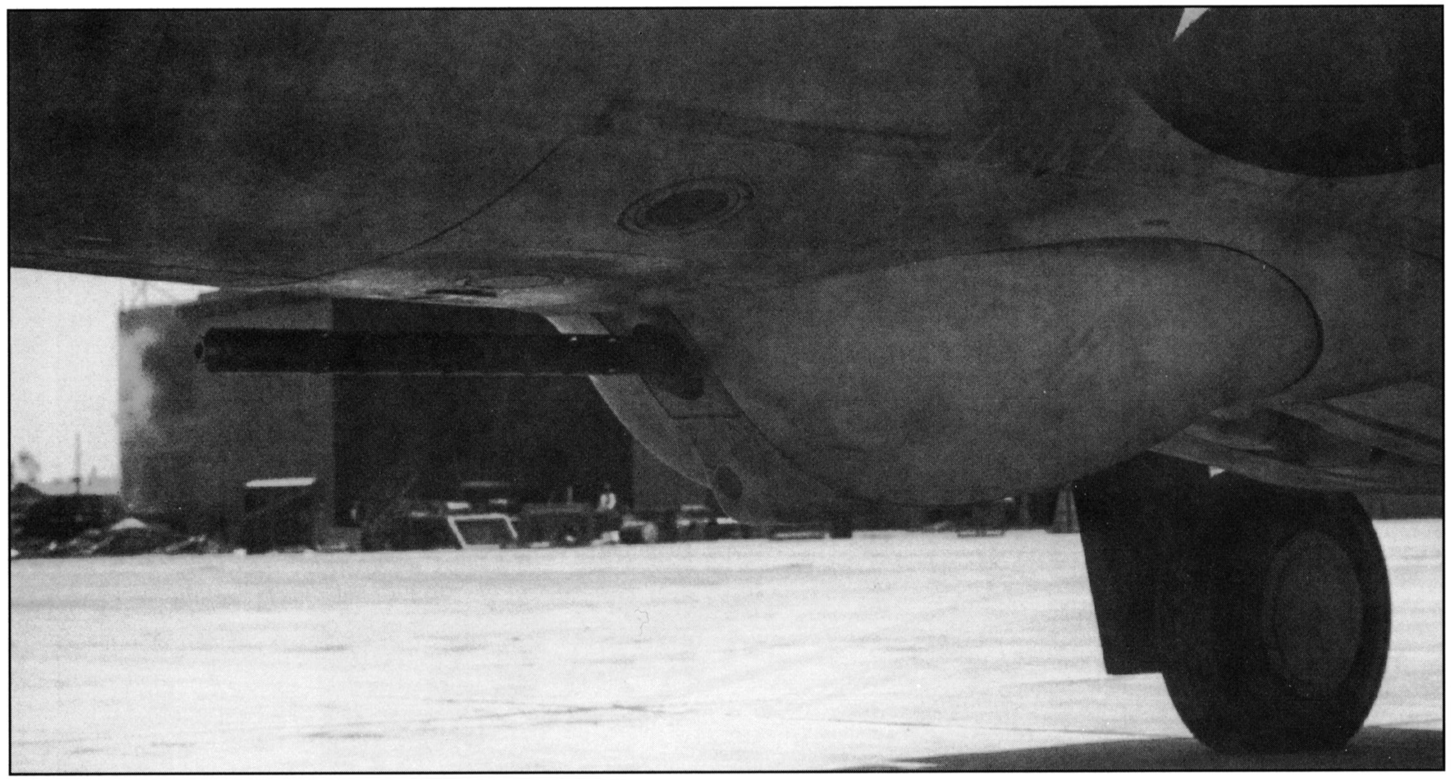
REMOTE CONTROLLED DEFENSIVE GUN TURRETS

The required defensive armament consisted of remote controlled, upper and lower gun turrets operated through a Farrand telescopic periscope sight. This advanced feature offered the efficiency of one gunner controlling two turrets and promised a reduction in drag, thanks to the reduced size of the unmanned turrets. In operation, the gunner tracked his target through a periscope by use of a control handwheel. The gunner's movement of the control handwheel electrically operated the turrets and controlled the guns. Both turrets were provided with a contour follower and maneuver switch to interrupt the fire of the guns as they passed parts of the airplane's structure. The turret guns were .50 caliber and were provided with 500 rounds of ammunition for the upper gun and 300 rounds for the lower





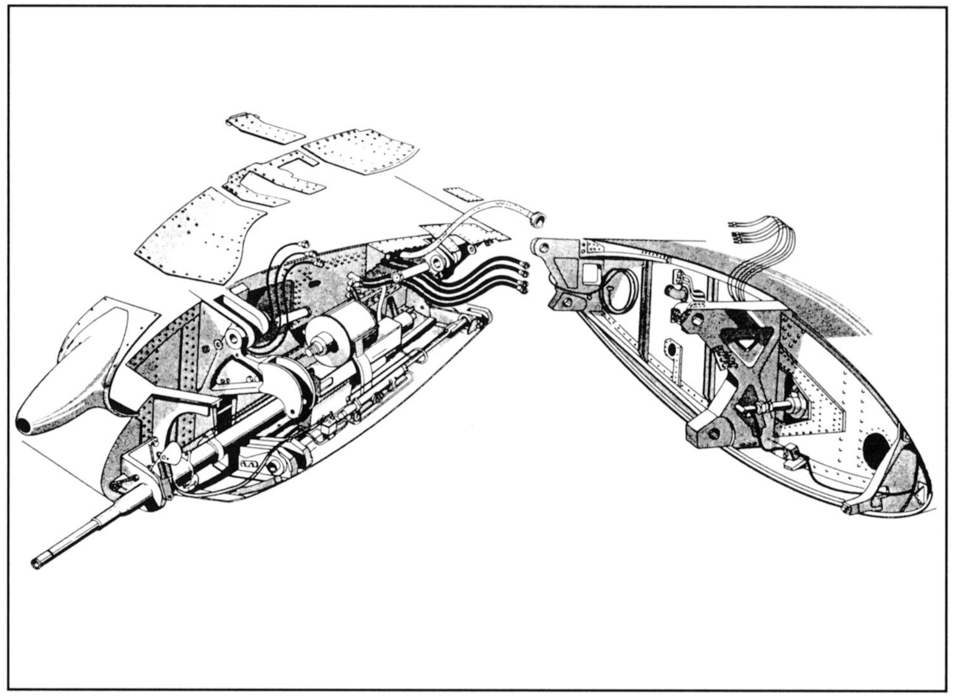
Above, upper gun turret and gunner's enclosure with the periscope in its center. The gunner's hatch swings up to allow the gunner to enter the aircraft. Below, lower .50 cal. gun turret on 7-24-44. (MFR)



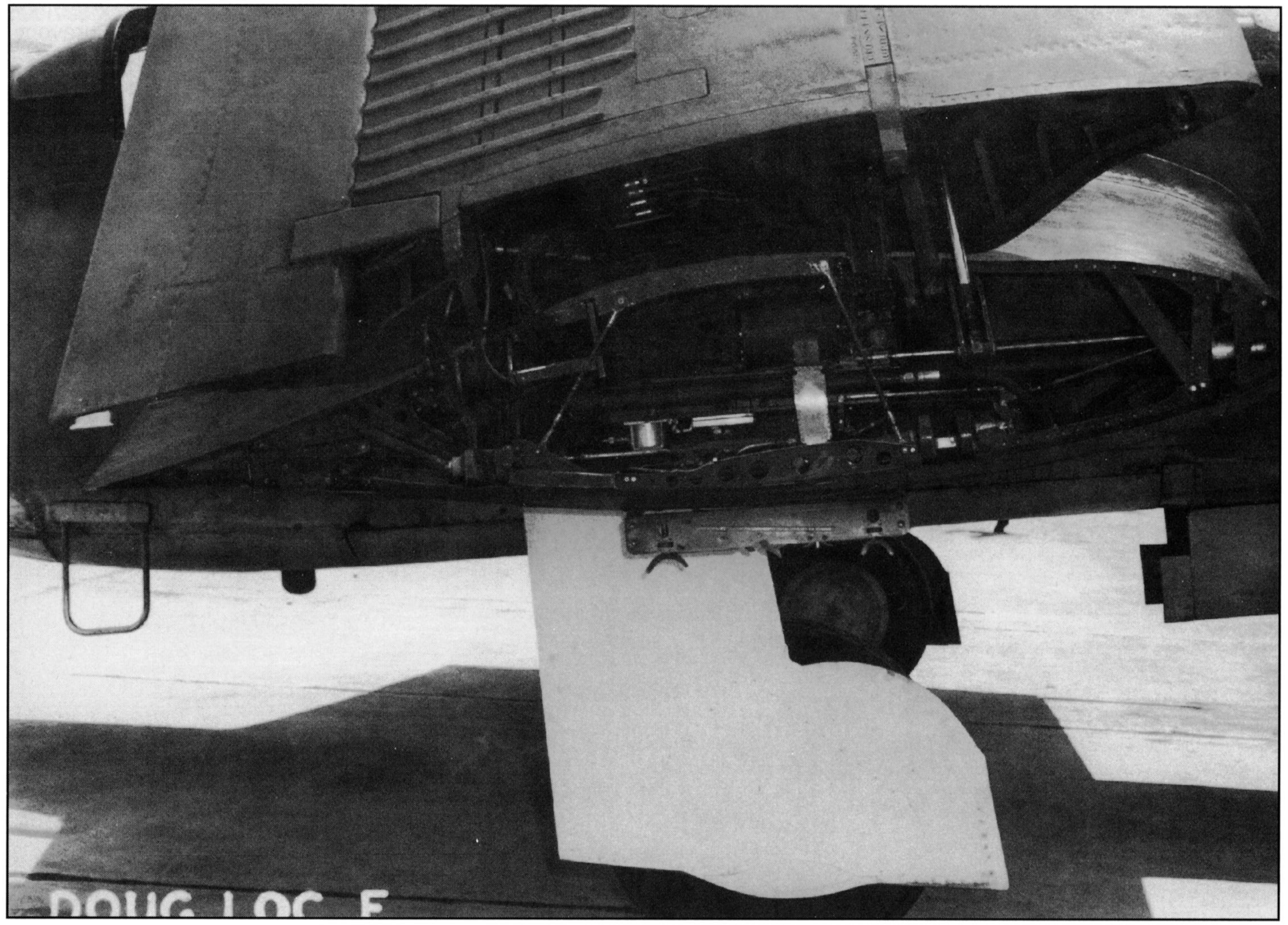
The Farrand telescopic periscope sight was built around a double ended periscope that was designed to cover the entire sphere and included the eyepiece and upper and lower periscopes. A combination of mirrors optically shifted the periscope-in-use in response to the gunners tracking of his target. As for its telescopic powers, because the upper and lower tubes were reducing telescopes, the eyepiece tube compensated for that reduction by magnifying the image so that the over-all power was one. In the end, the weight of the turrets and the experiences of war questioned the wisdom of installing defensive armament on single-engined airplanes.

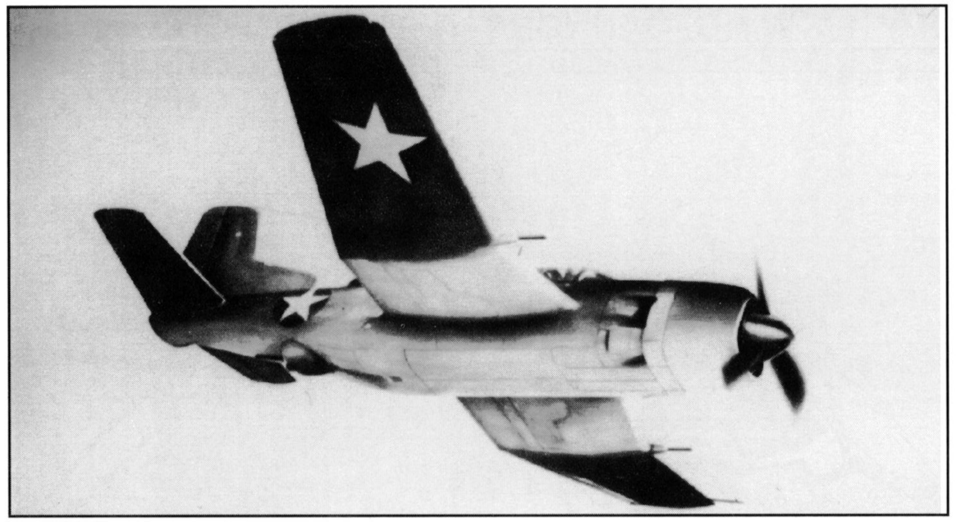
The offensive armament consisted of one 20mm cannon located between the wingfold and the main gear on each wing.

WING CANNONS AND WINGFOLD

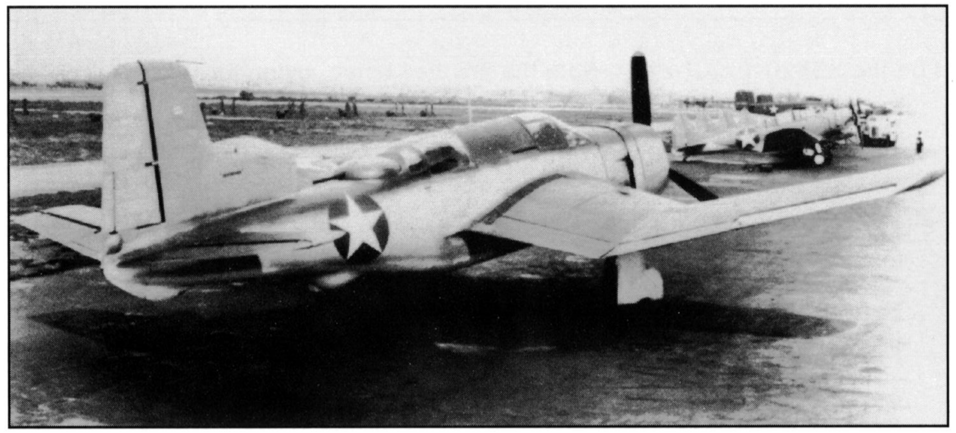


Below, the wingfold and cannon installation on the XSB2D-1 on 7-24-44. Note the practice bomb pylon located between the landing gear door and the wingfold. (MFR)



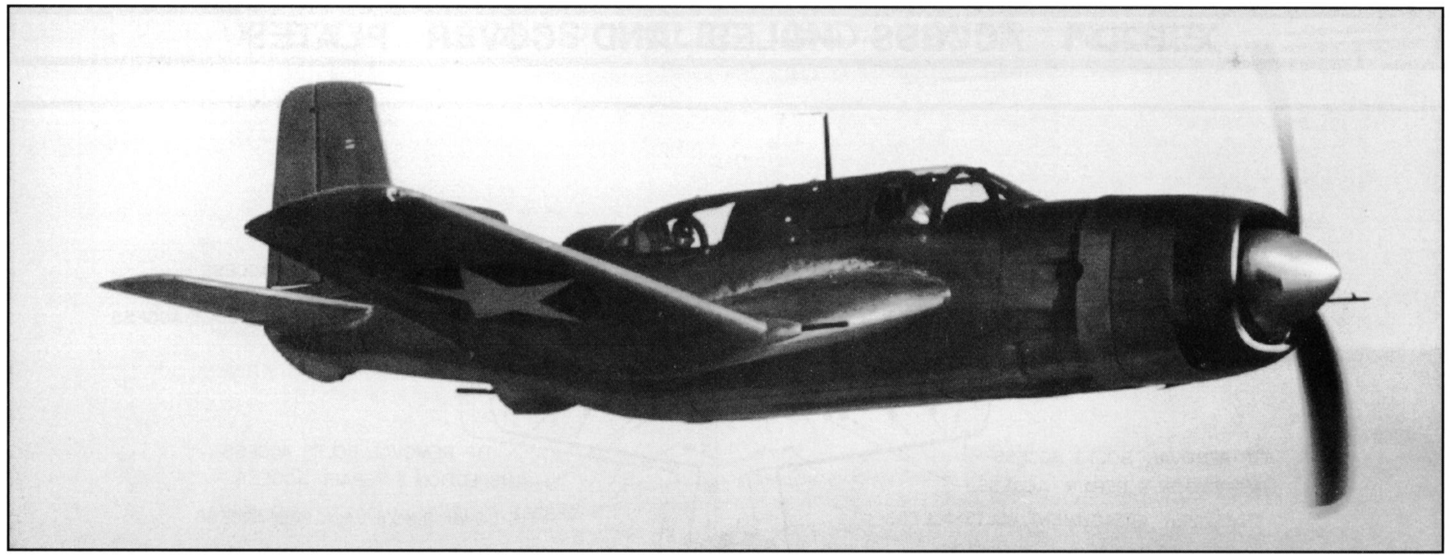


Above, heavily retouched photo of the XSB2D-1 on its maiden flight on 4-3-43. Note the original round style national insignia. (MFR) Below and bottom, The XSB2D-1 after its first flight. The prop dome and nose gear were originally natural metal. Note the black wing walk on the upper wing and the SBDs in the background, which the XSB2D-1 was designed to replace.



For a variety of reasons, including the sudden expansion of the workforce by the infusion of untrained war workers, new mass production techniques, and the laminar flow airfoil's demand for stricter production tolerances, the production of the XSB2D-1 took seventeen months. When completed, the airplane's weight was about 2,500 pounds over the Navy specifications. The airframe accounted for half of this overweight condition while the remainder can be attributed to the government furnished equipment. Additionally, the projected costs indicated that the airplane would be very expensive. All of these factors pointed towards a failure, and Ed Heinemann vowed to learn from these mistakes.

When the XSB2D-1 first flew in April 1943 it demonstrated good high speed handling characteristics, but it did handle poorly at low speeds. That could be partially attributed to the positioning of its wing which created the short-coupled effect. The low speed deficiency could have prevented its acceptance as a carrier-based aircraft, but because of its complexity and overweight condition, the XSB2D's performance was not up to expectations. The official cancellation in June 1944 was a moot point because, by then, its successor, the BTD-1, had been flying for three months. One must, however, credit the Douglas design team's achievements in meeting the Navy's requirements. Their design did enter into flight test service, contributing much to the development of the dive brake, while its contemporaries were either "abandoned at an early stage" (Curtiss XSB3C-1), or rejected at the start (Brewster's Design Project P-37).

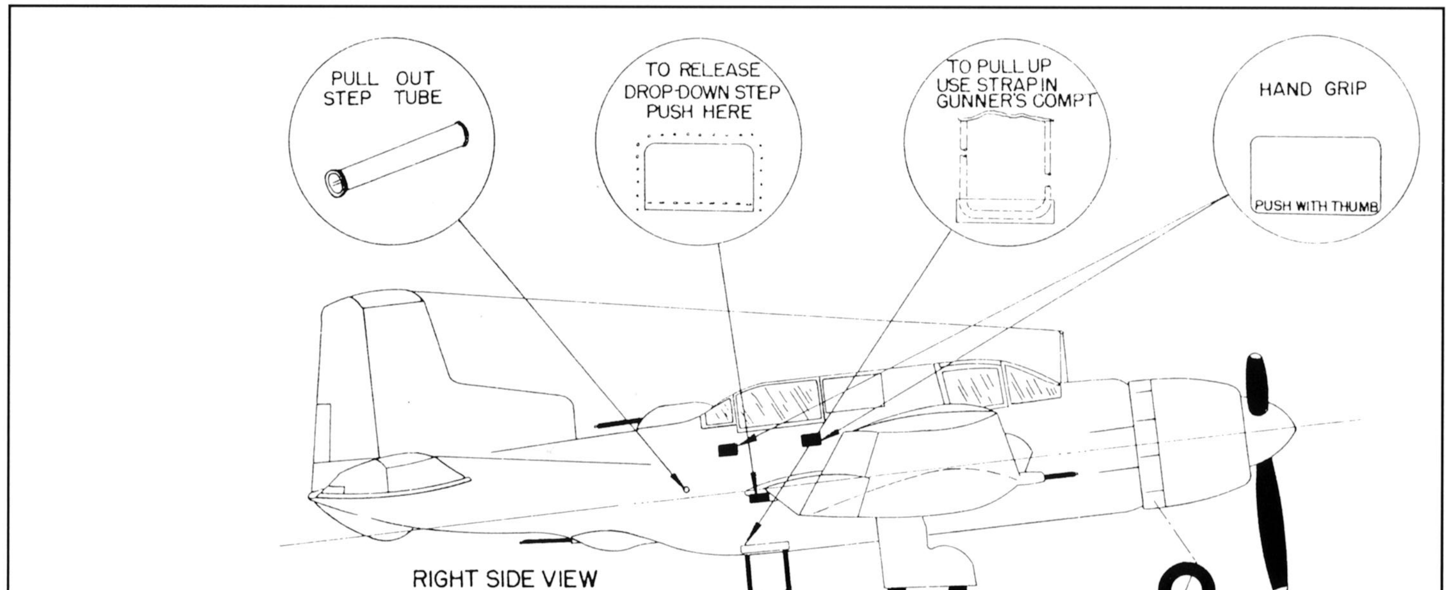


Above, XSB2D-1 in flight with a wide red stripe around the forward engine cowl. (MFR)

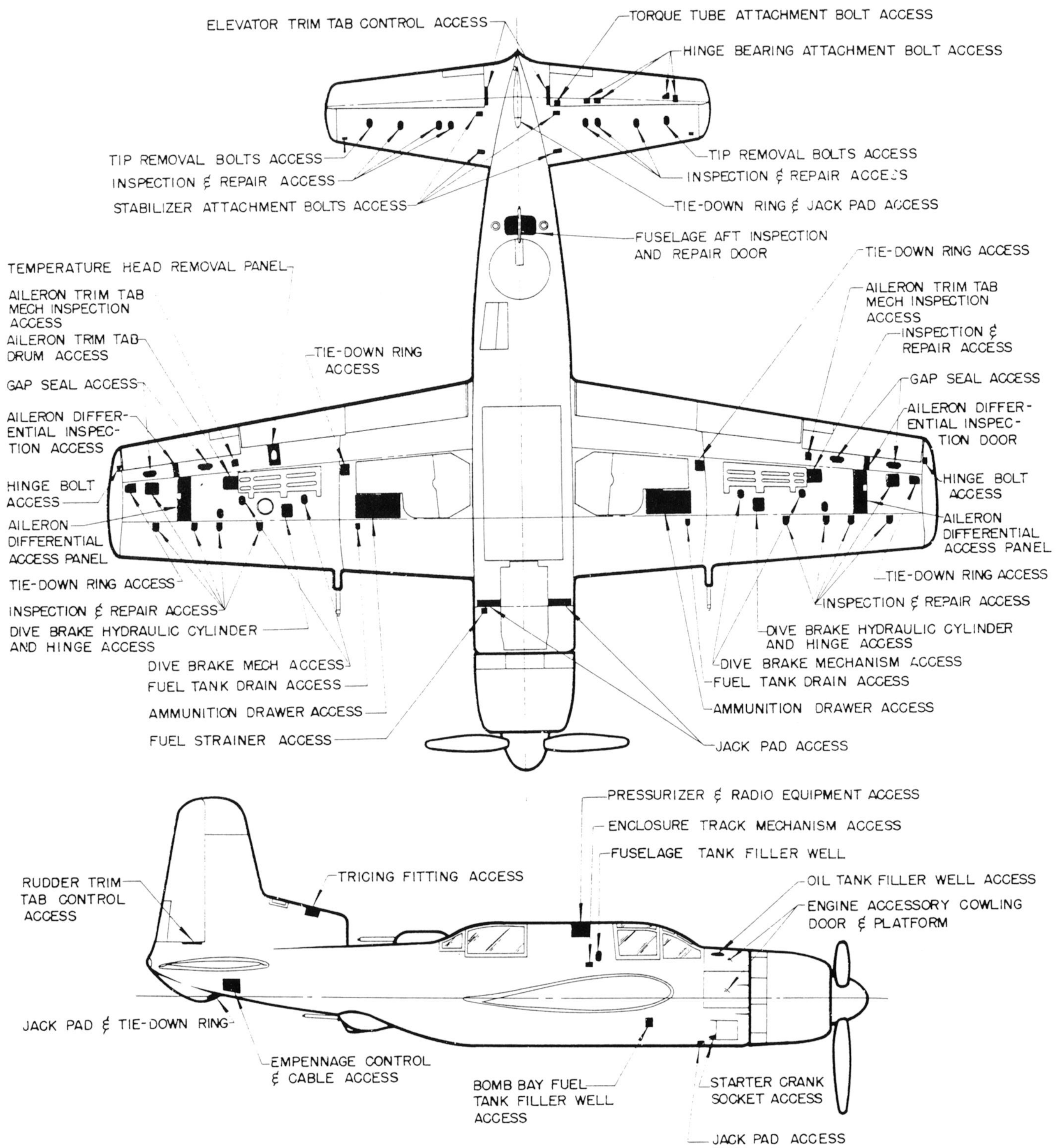
Production was limited to the two prototype airplanes, both of which were ultimately assigned to the Ames Aeronautical Laboratory of NACA (National Advisory Committee on Aeronautics). In 1944 the 40-by-80 foot, full-scale wind tunnel of the Ames Aeronautical Laboratory began operation at NAS Moffett Field. The XSB2D-1 was the first aircraft type to be tested by the Flight Research Division. As the first airplane to be a flight test program subject, the flight tests probably were more involved with the verification of derived wind tunnel data than with any improvement of the XSB2D-1. But other testing could have centered around the effectiveness of dive brakes, which were becoming more critical as airplanes became heavier and faster.

BuNo 03551 arrived at Ames on 9 October 1944. It remained in service with Ames until 24 May 1946 ,when it was destroyed during a test flight. The flight crew consisted of pilot George Cooper and observer Welko Gasich. About 30 miles south of NAS Moffett near Las Gatos, the engine backfired and a fire started in the R-3350's induction system (there was a rash of similar fires with early R-3350- 0`0o9ipp-powered B-29s). Not being able to return to NAS Moffett Field, pilot George Cooper crash-landed the airplane. Although neither crew member was seriously hurt, the airplane was destroyed.

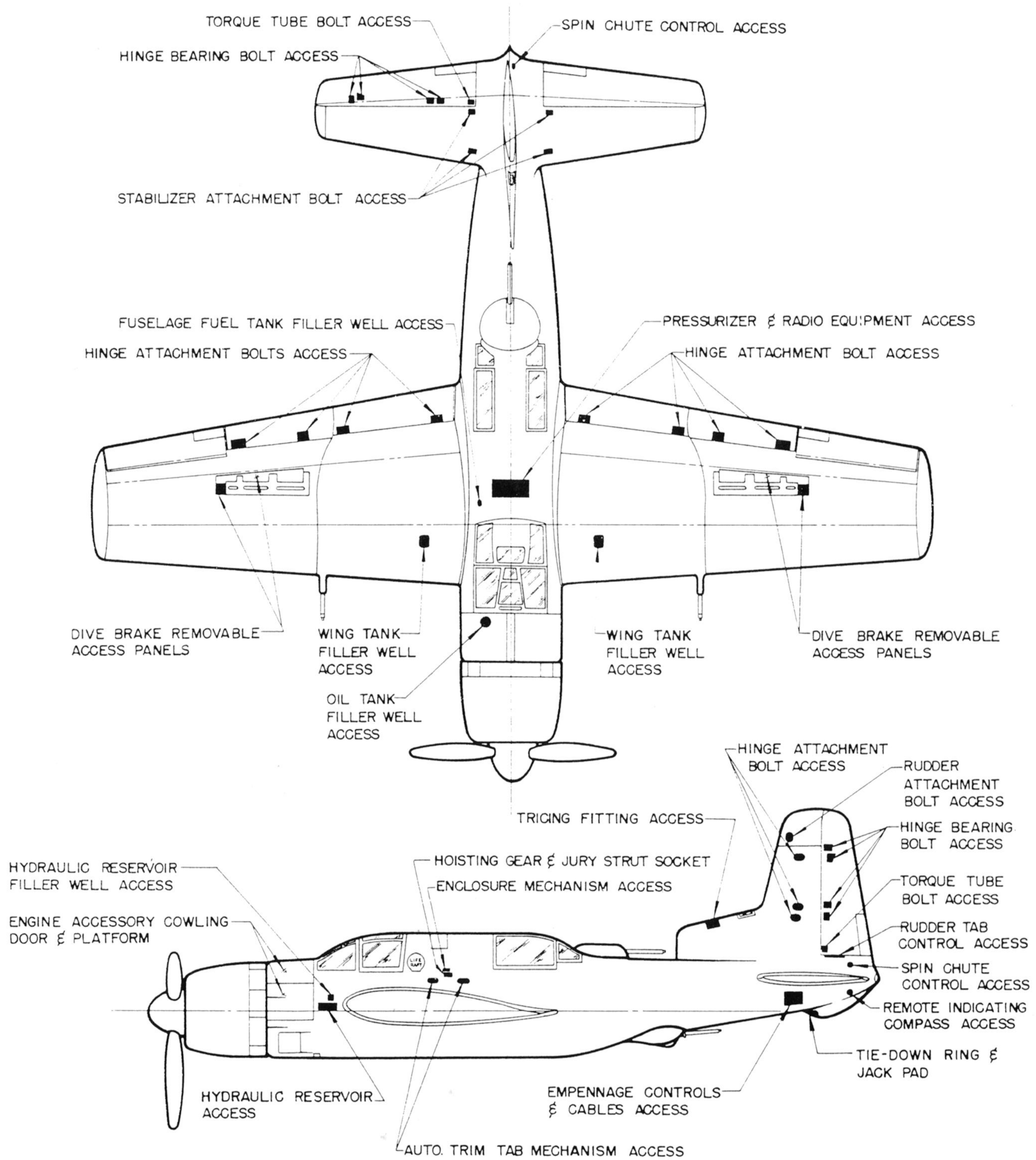
BuNo 03552 began its service life with Ames on 12 June 1944 and was scrapped in late 1945.



cockpit access



NOT TO SCALE. **These factory drawings show the XSB2D-1 with a extended vetical tail not seen in any photos.**

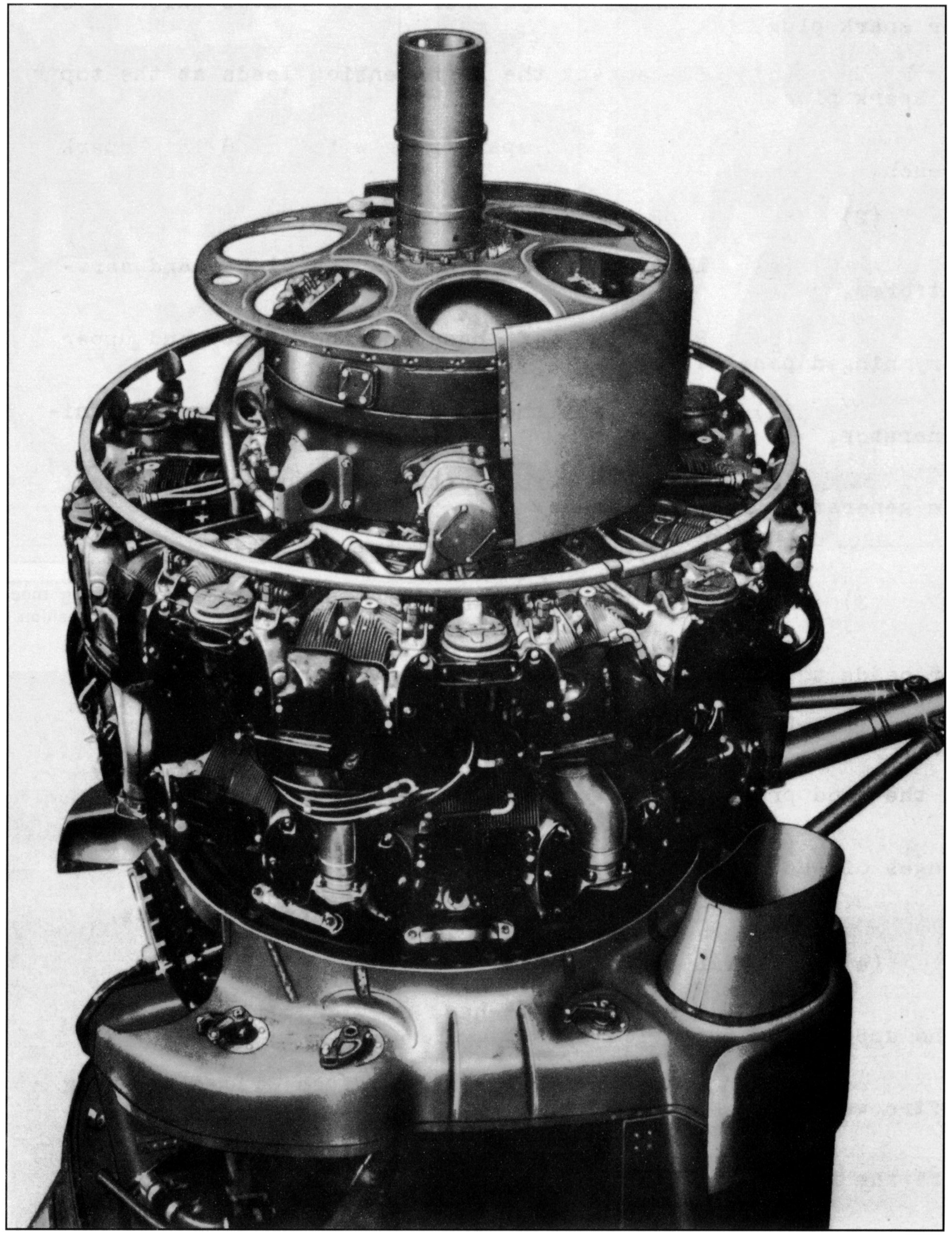


ACCESSORY ENGINE COWLING OPENED FOR SERVICING

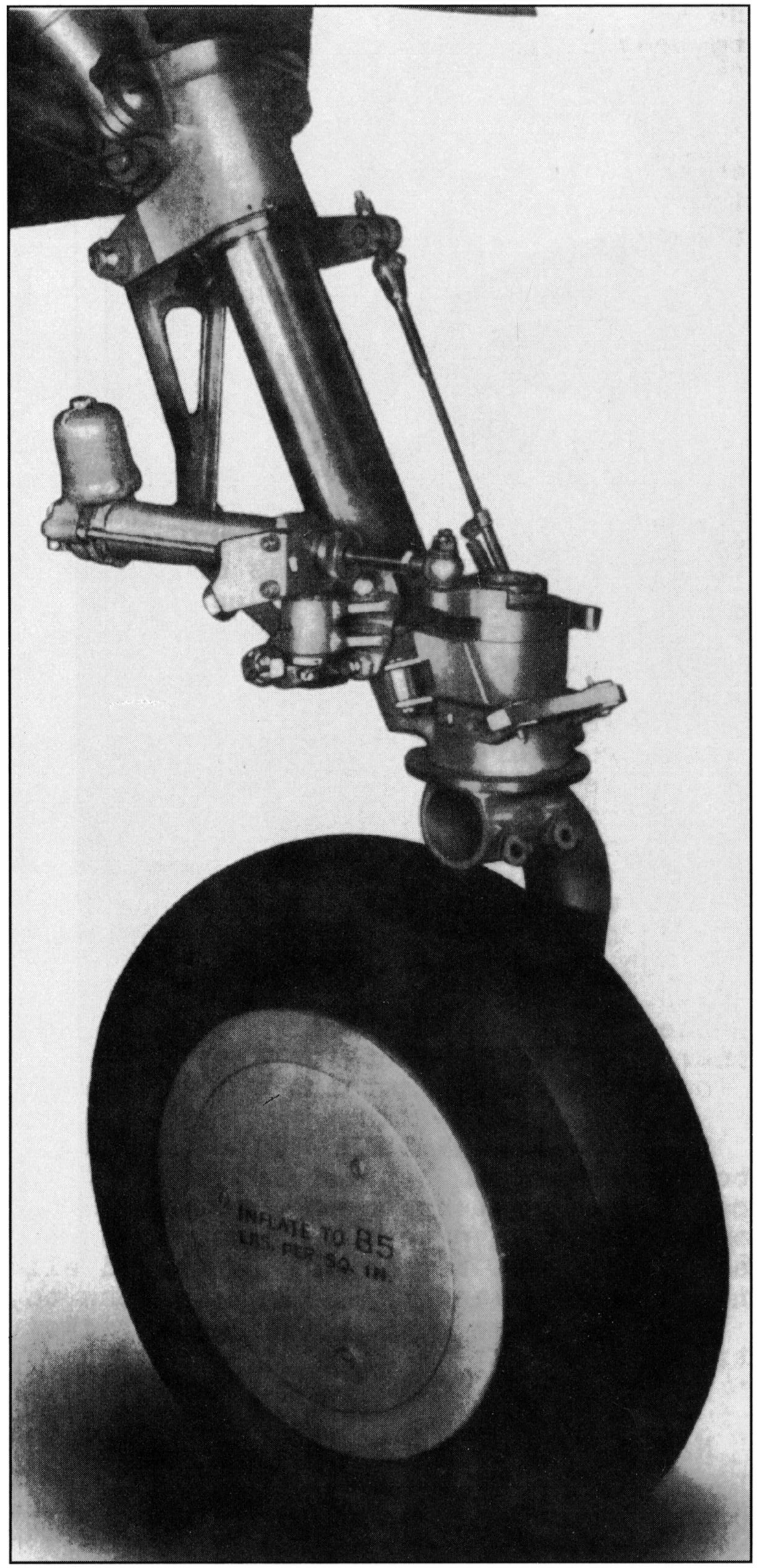
The upper accessory cowling doors open upward and lock in the up position. The lower doors fold down to create a work platform. Note the position of the engine exhaust stacks and the open cowl flaps. Note hydraulic reservoir filler location on the fuselage side. (MFR)

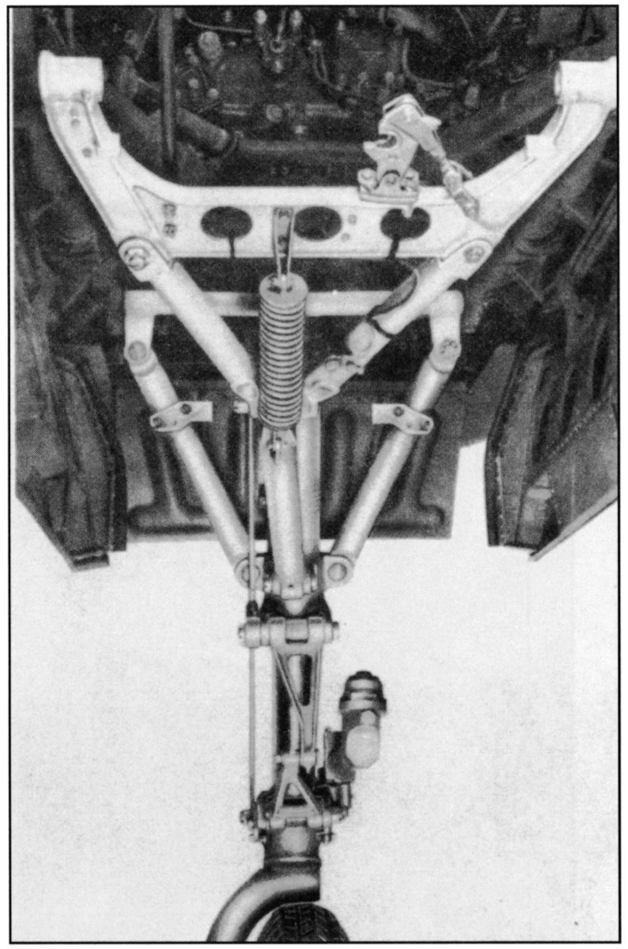
R-3350 ENGINE WITH ALL ENGINE COWLS REMOVED

The Wright R-3350-14 engine was the newest and biggest engine available at the time with a rating of 2,000 HP. The upper half of the fixed nose spinner fairing is removed in this illustration. (MFR)

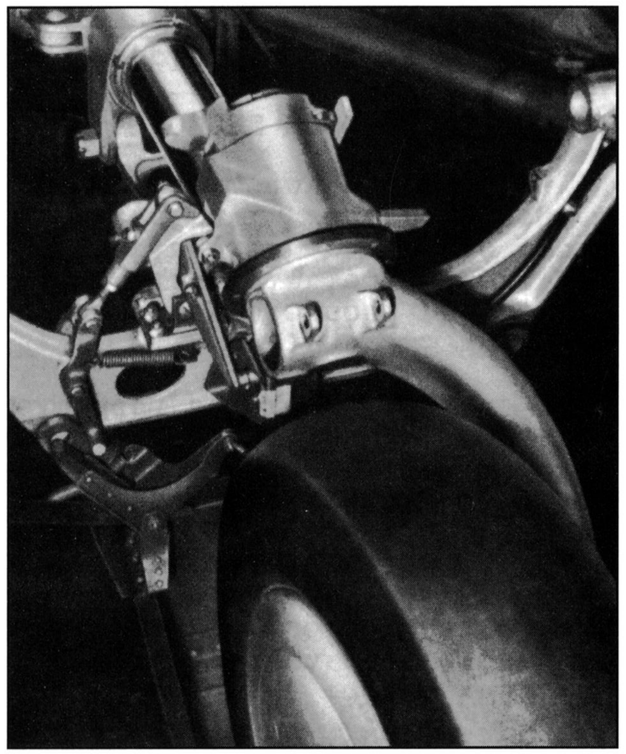


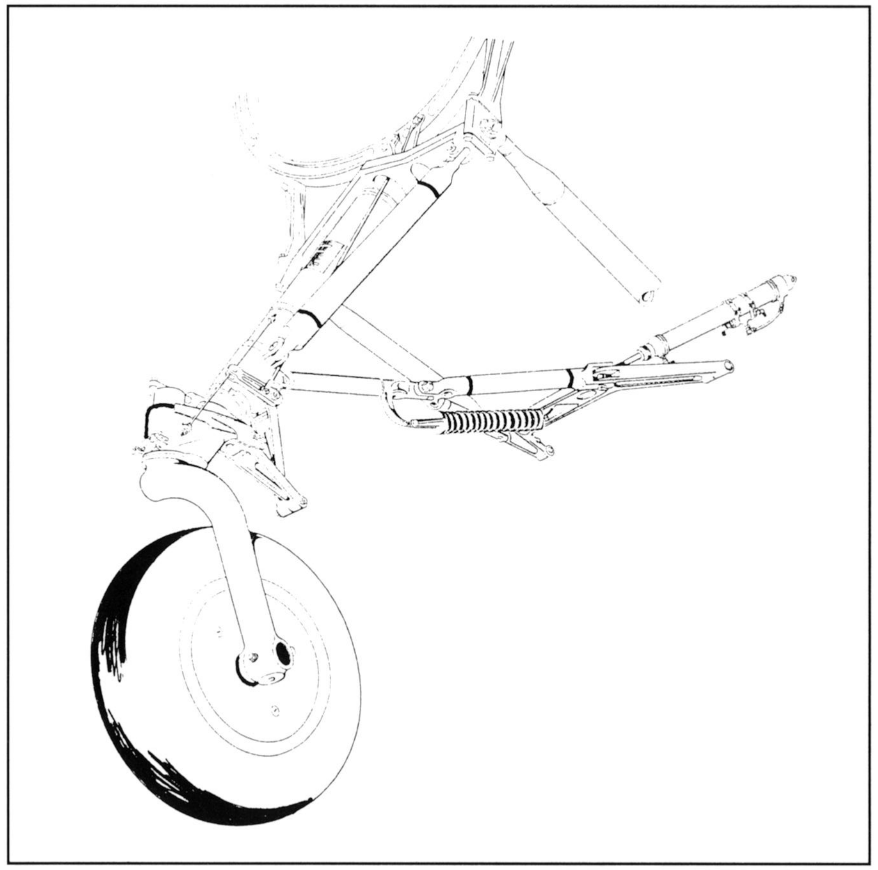
The nose wheel gear is mounted underneath the engine mount and is composed of a yoke, a cylindrical shock-absorbing strut assembly, and various links and cylinders. The shock strut is supported by a retracting link, two side braces, and by a crossbeam at the upper end of the strut, which is attached to the engine mount ring.

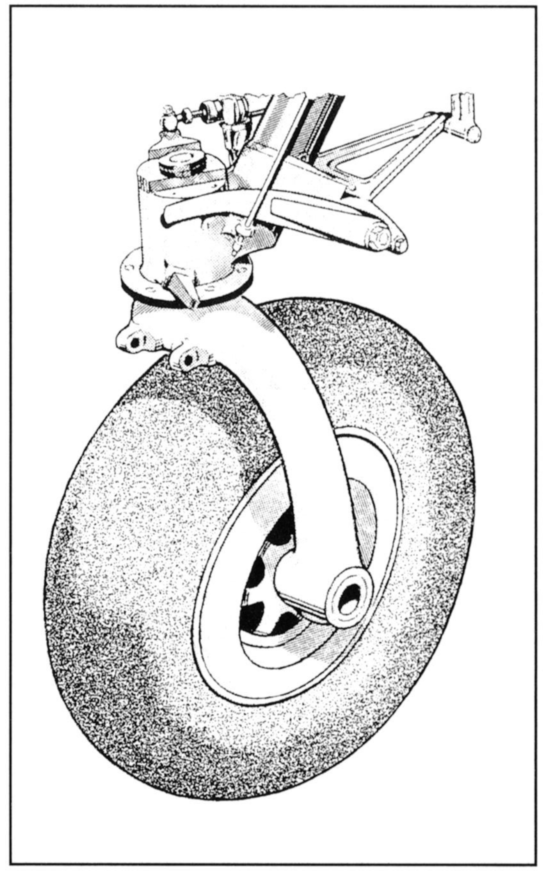


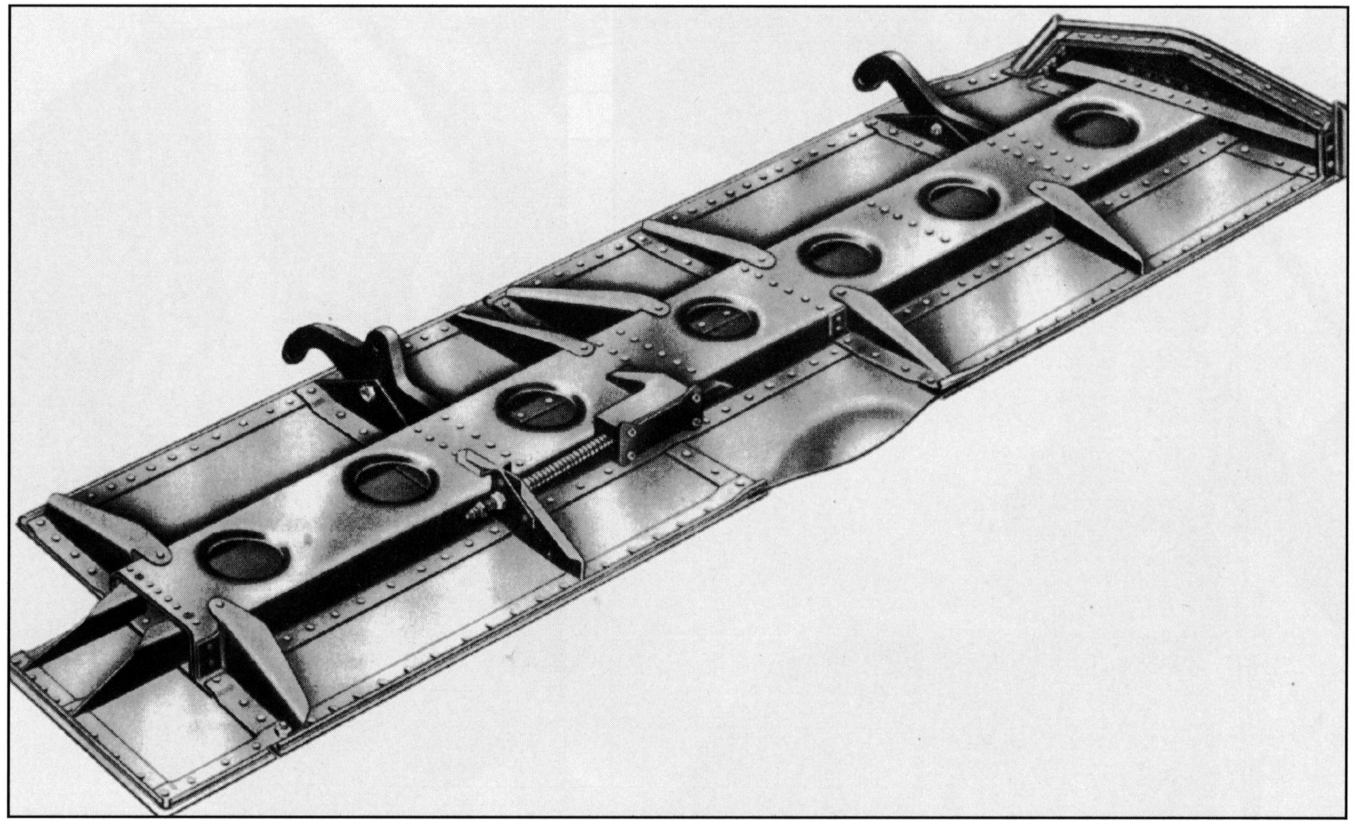


Above, nose wheel gear retracting mechanism. Below, nose wheel gear in the up position. At right bottom, nose wheel door. (MFR)



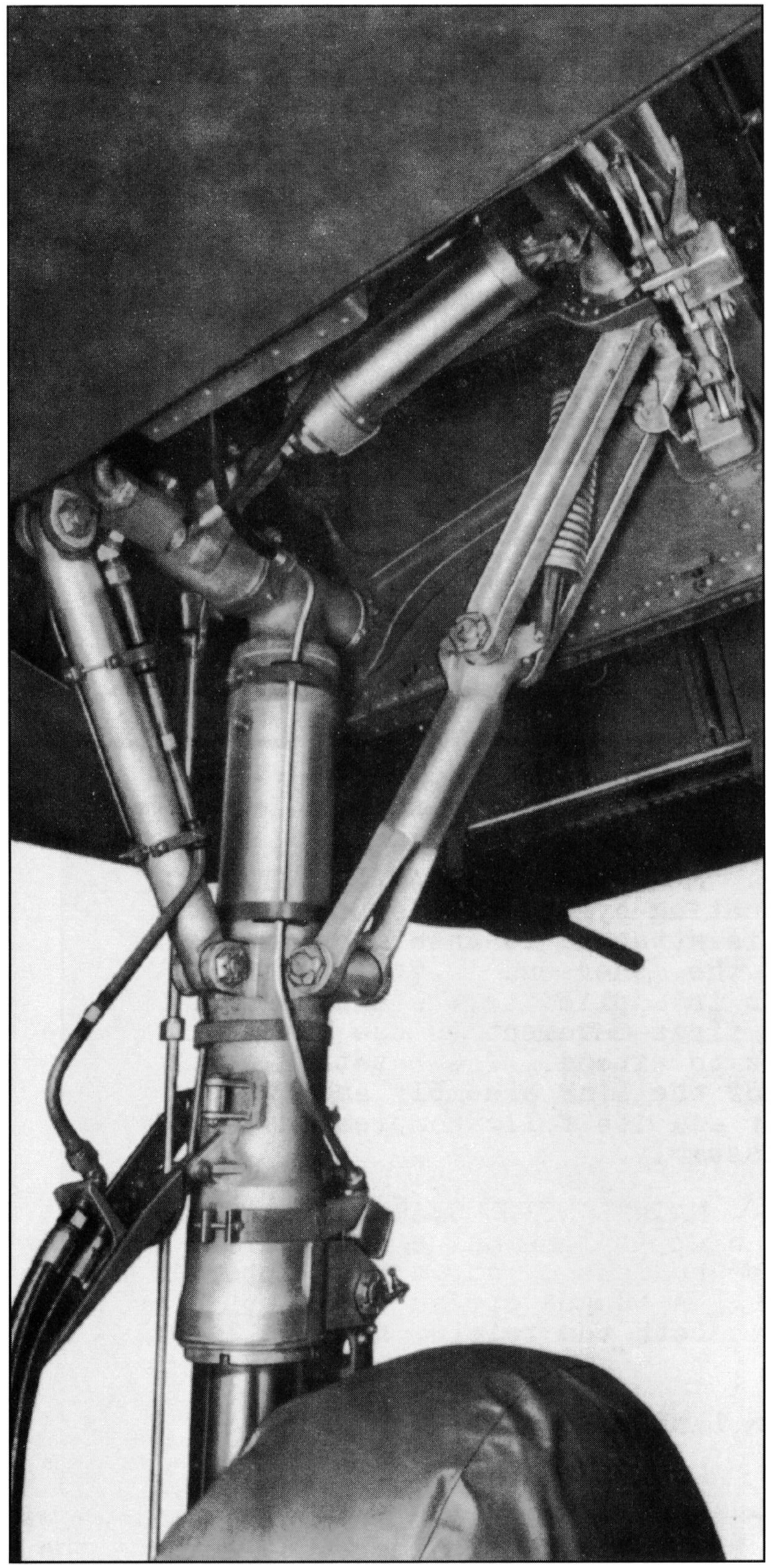


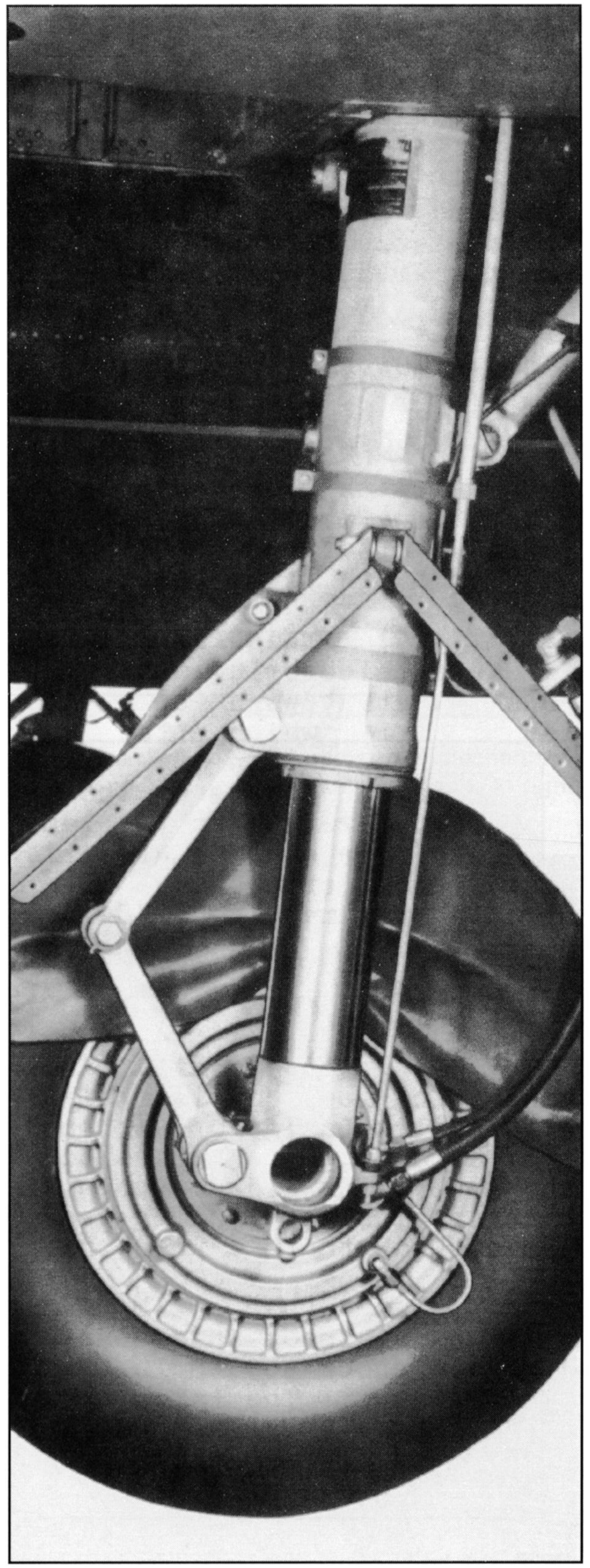


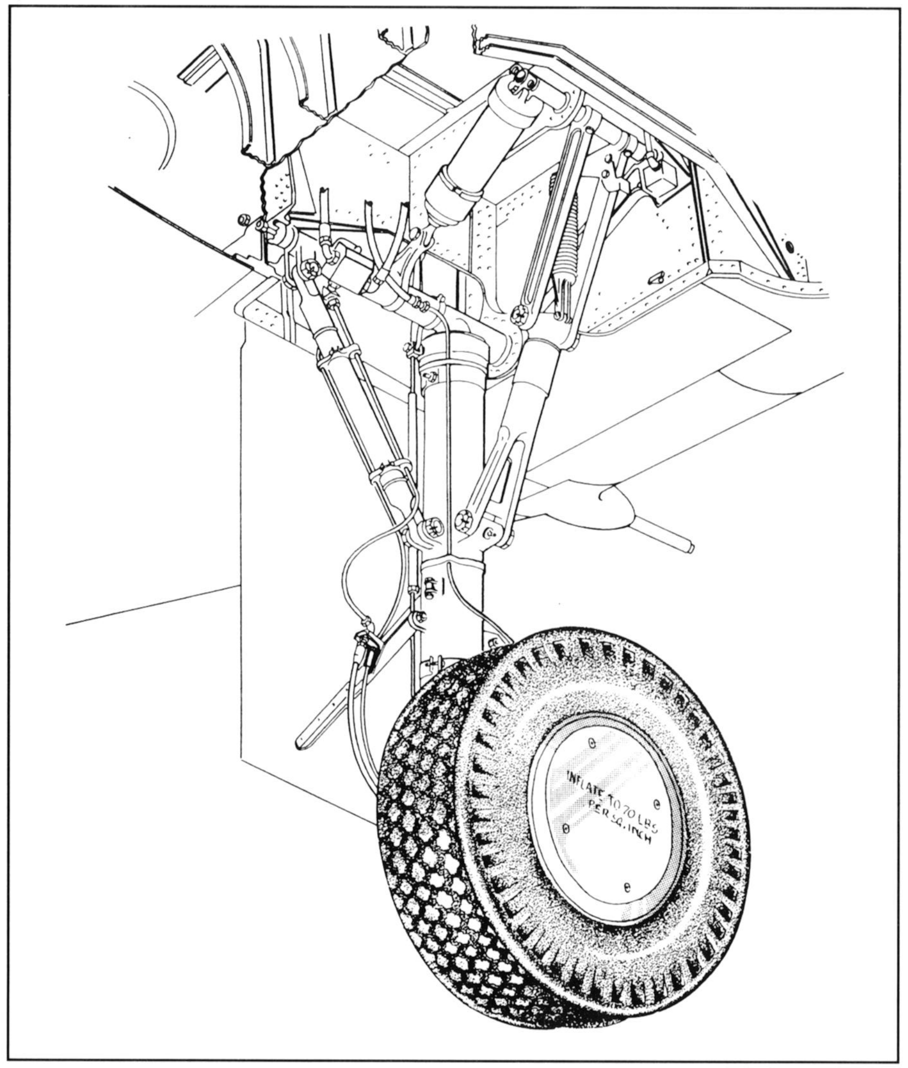


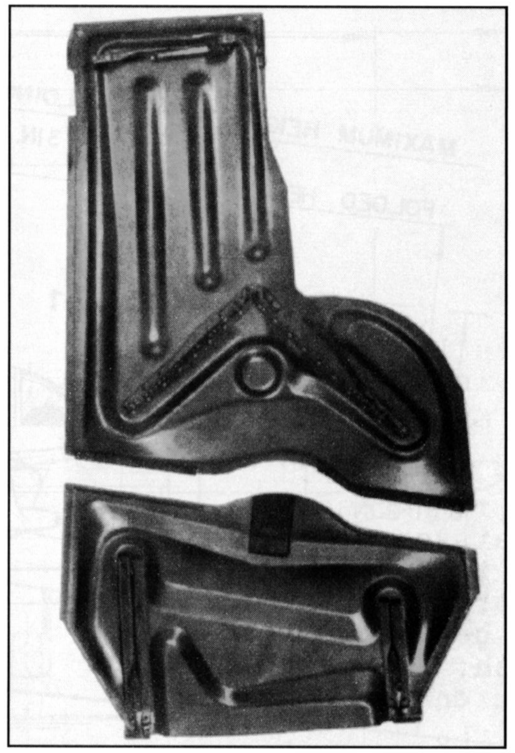
The main landing gear are equipped with Bendix pneudraulic shock absorber struts. The struts are hydraulically raised by actuating cylinders, and are compressed by a telescoping linkage mechanism to permit them to fit into the wheel wells. The brake system is equipped with an emergency air system which operates the brakes in case the hydraulic system fails.

Below left, right main landing gear actuating mechanism without the landing gear doors being mounted. Below, main landing gear telescoping mechanism view without the landing gear doors installed. (MFR)

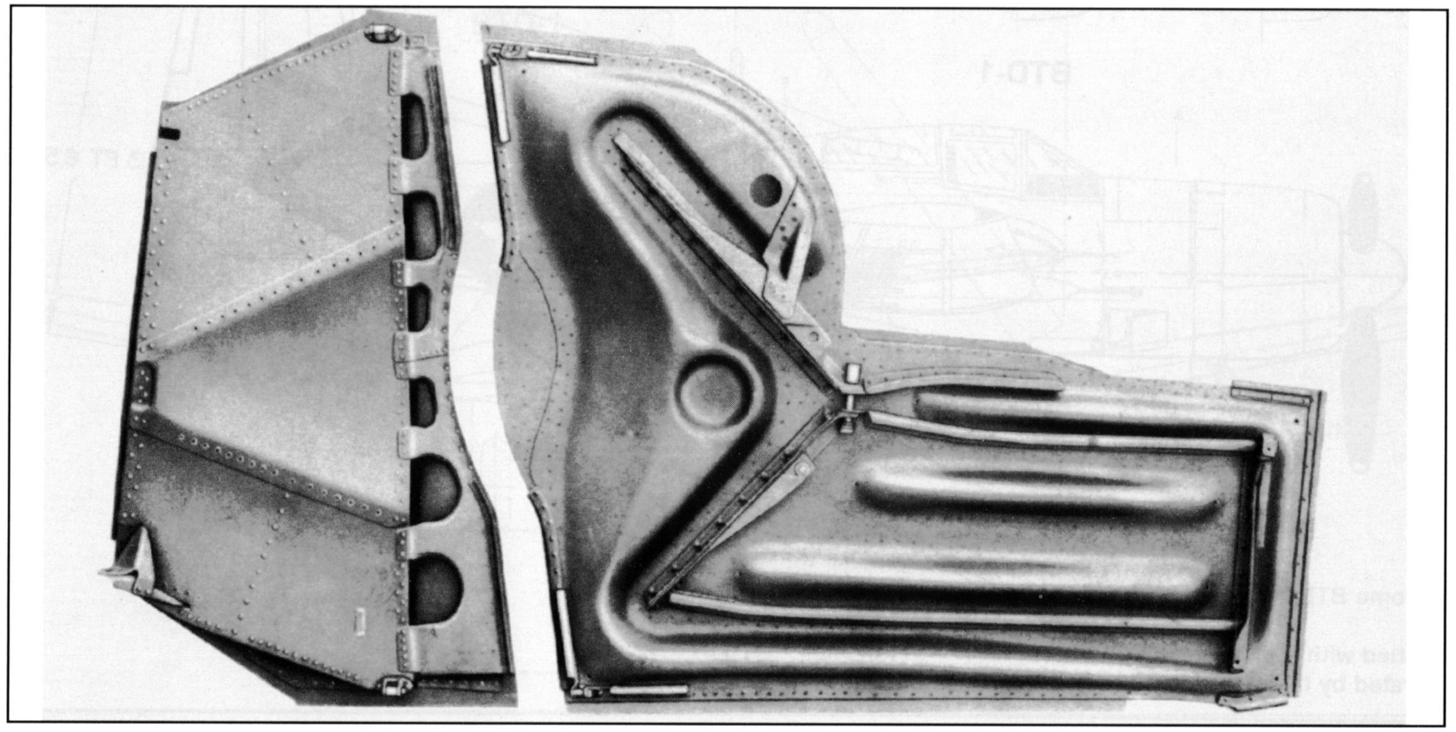


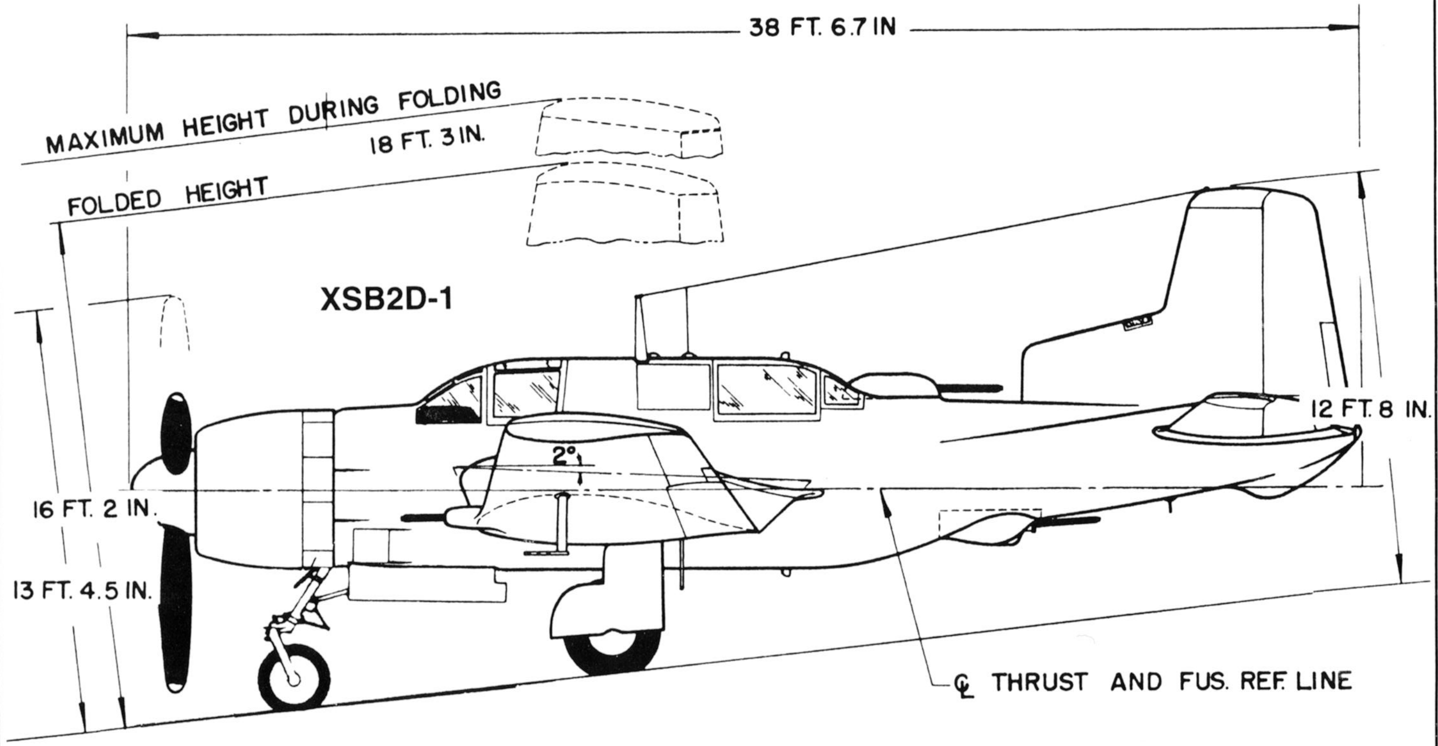




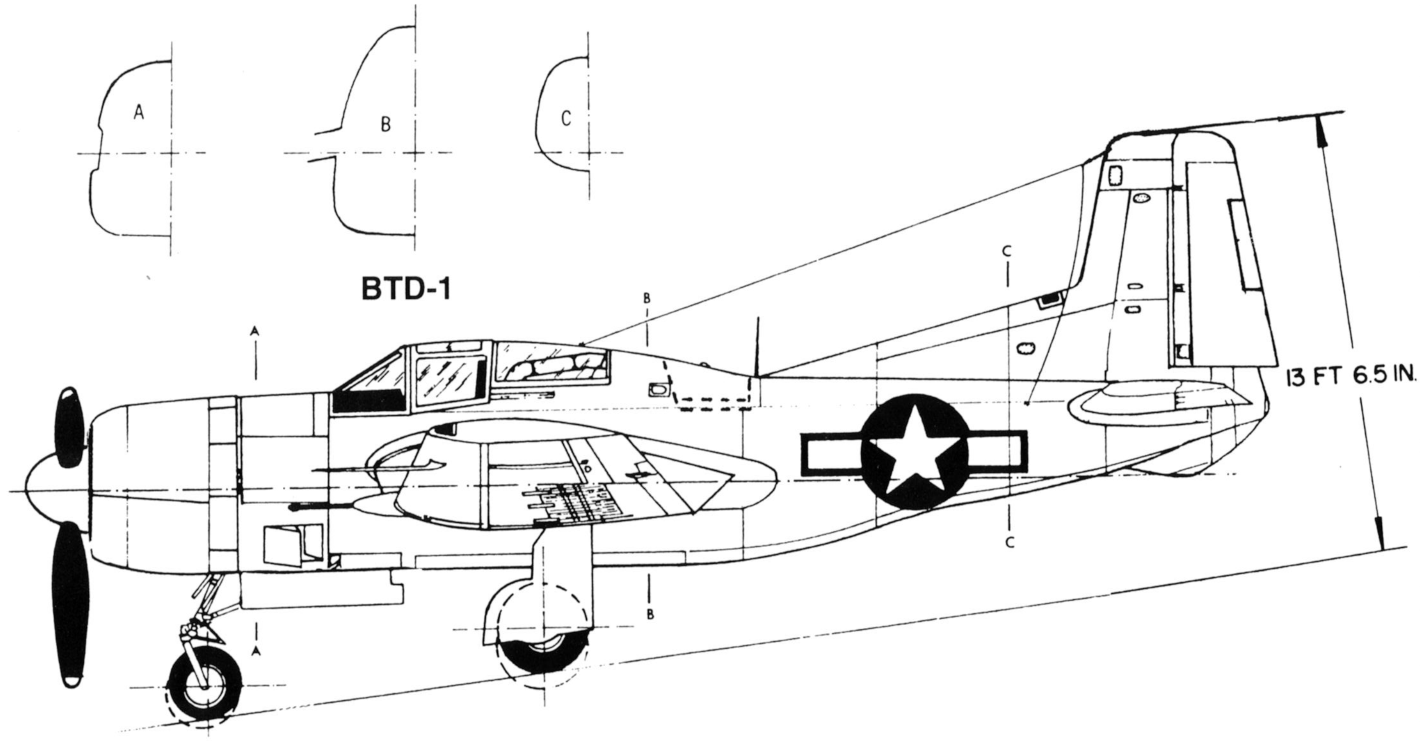


At left, right main landing gear drawing. Above, XSB2D-1 main landing gear doors. Below, BTD-1 main landing gear doors with steel plating added to the inboard gear door. (MFR)

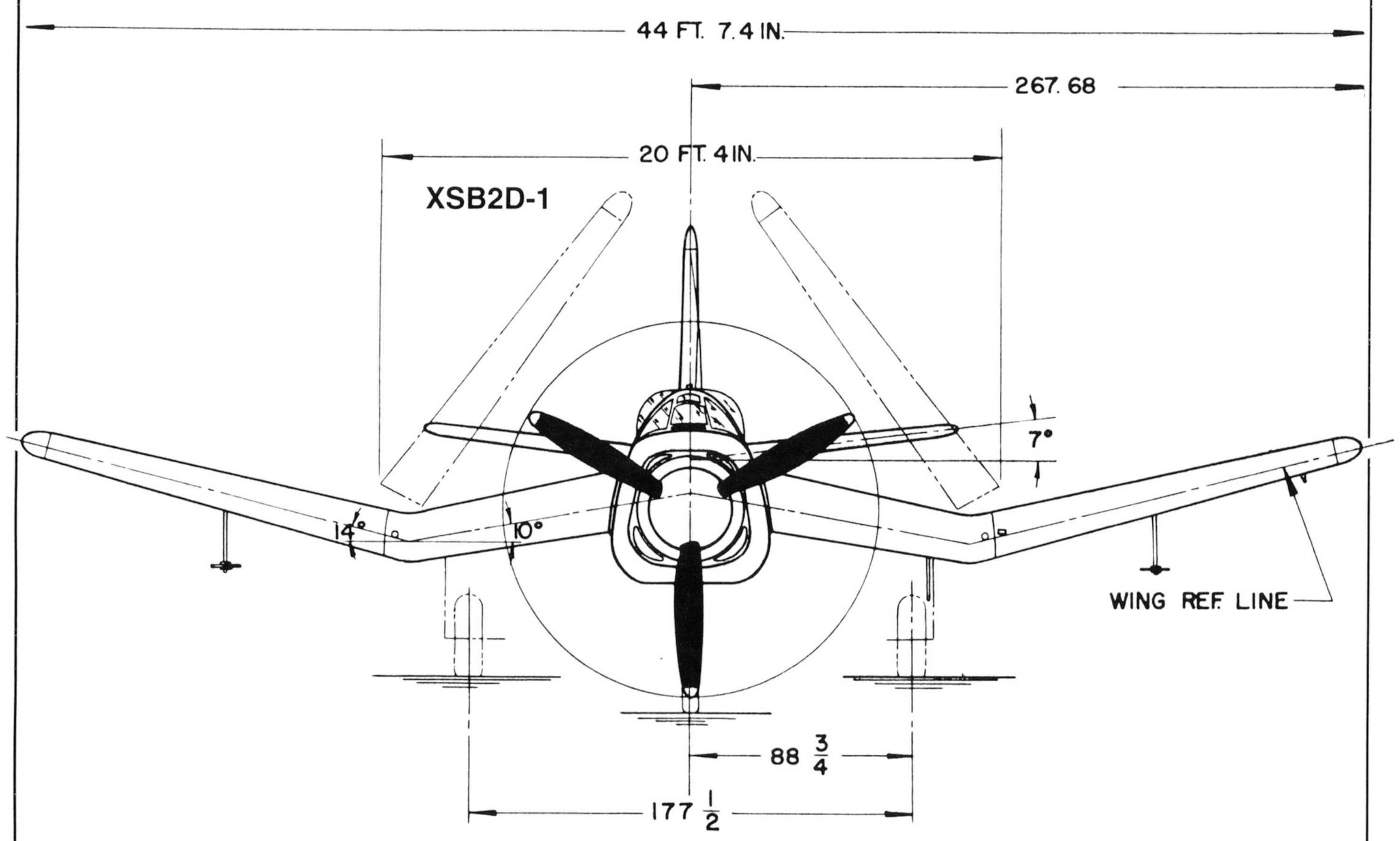


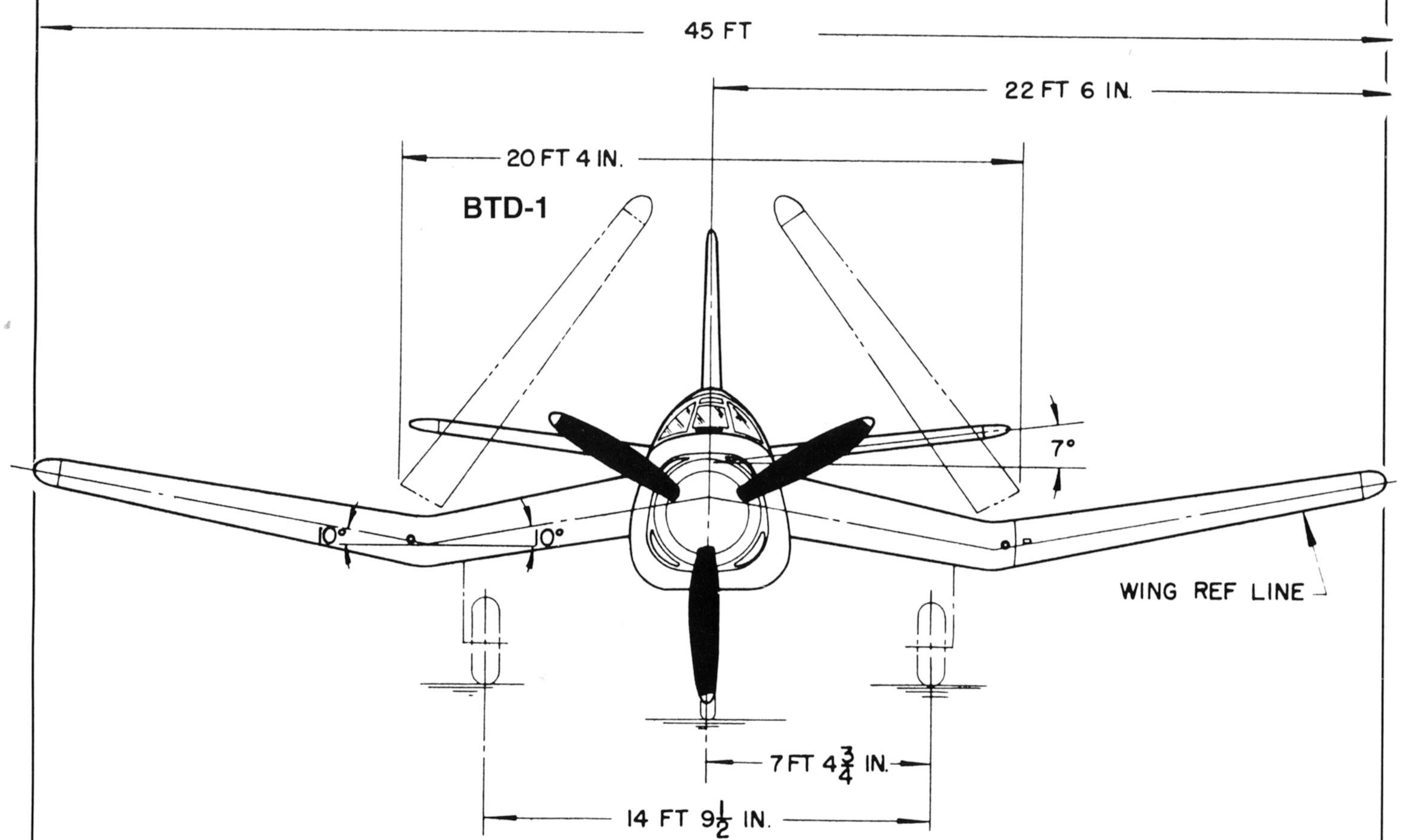


The measurements shown on the XSB2D-1 above are the same for the BTD-1 below.

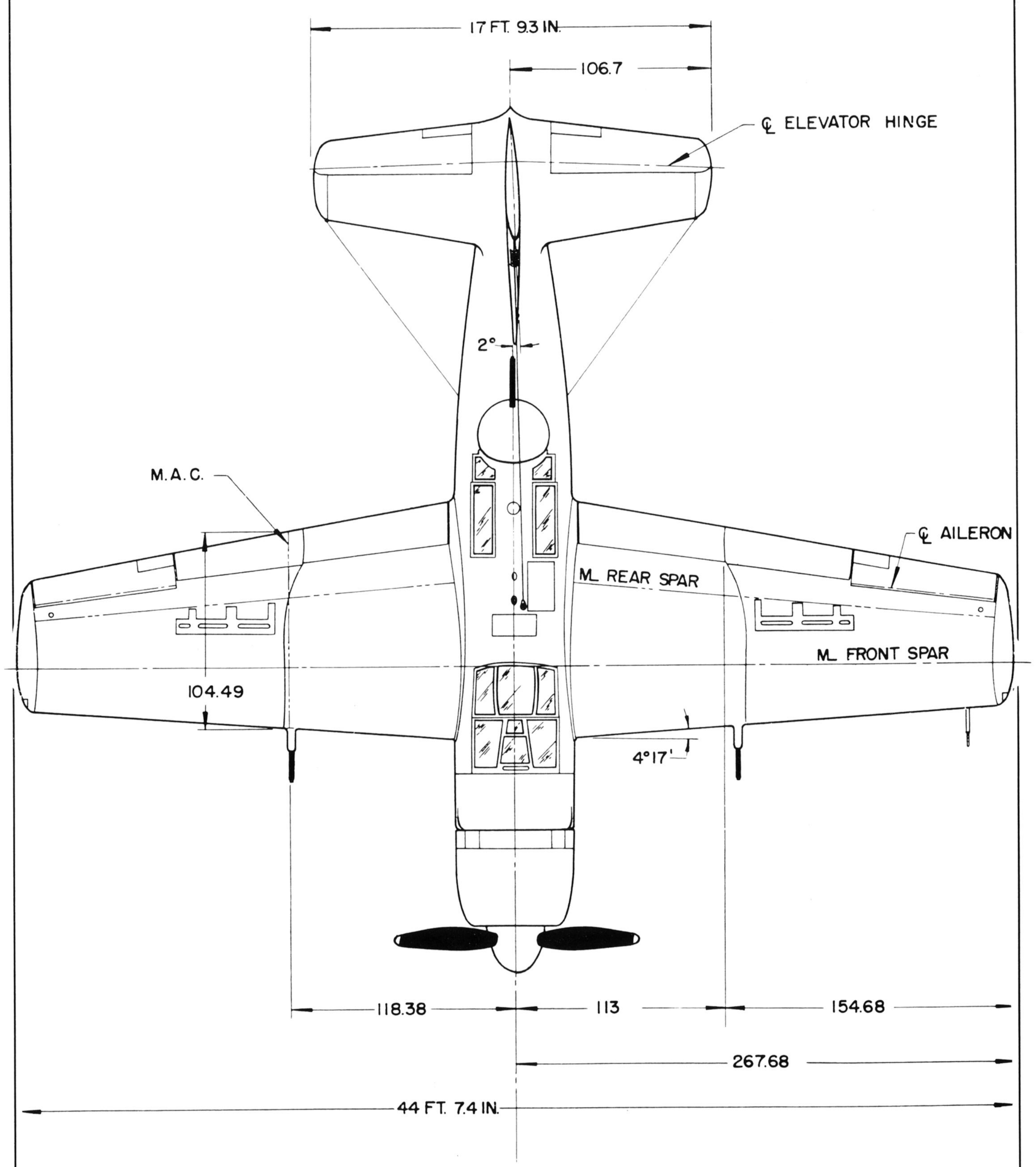


Some BTD-1s were fitted with an extended rudder. Also, some BTD-1s were fitted with a plexiglas hatch on the turtledeck, as illustrated by the dotted lines.

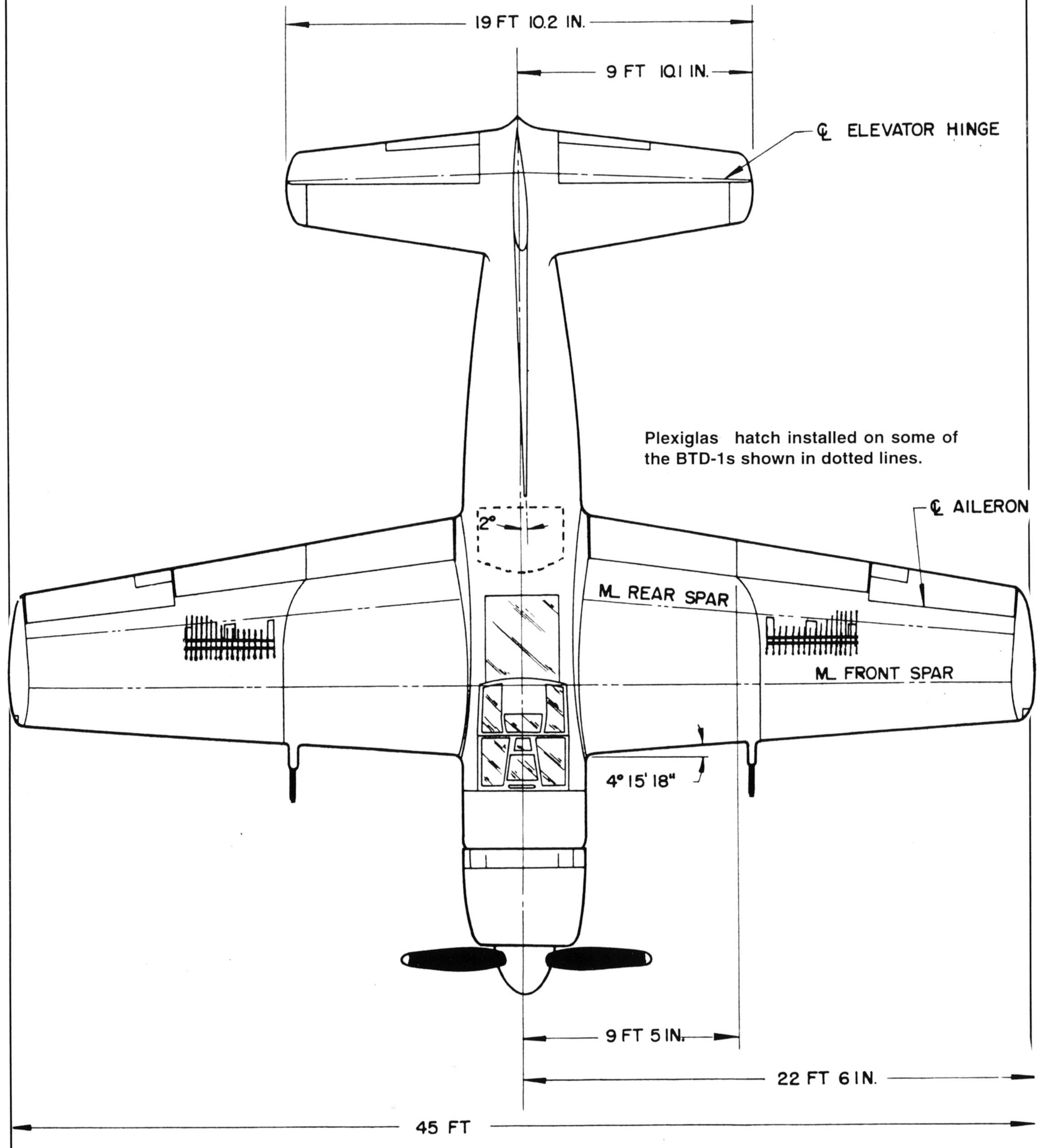




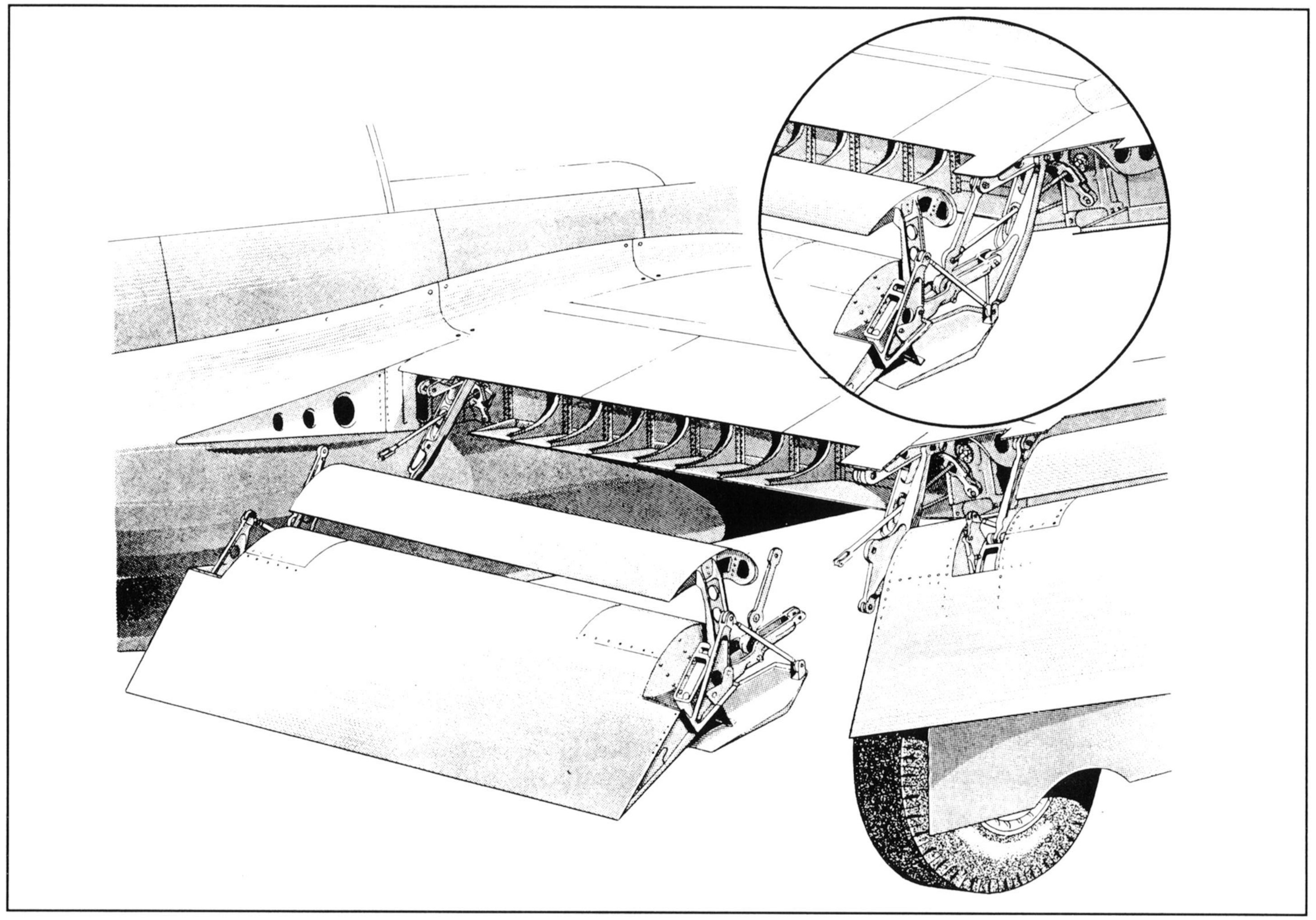
TOP VIEW OF XSB2D-1 WITH ORIGINAL WING DIVE BRAKES IN 1/72 SCALE

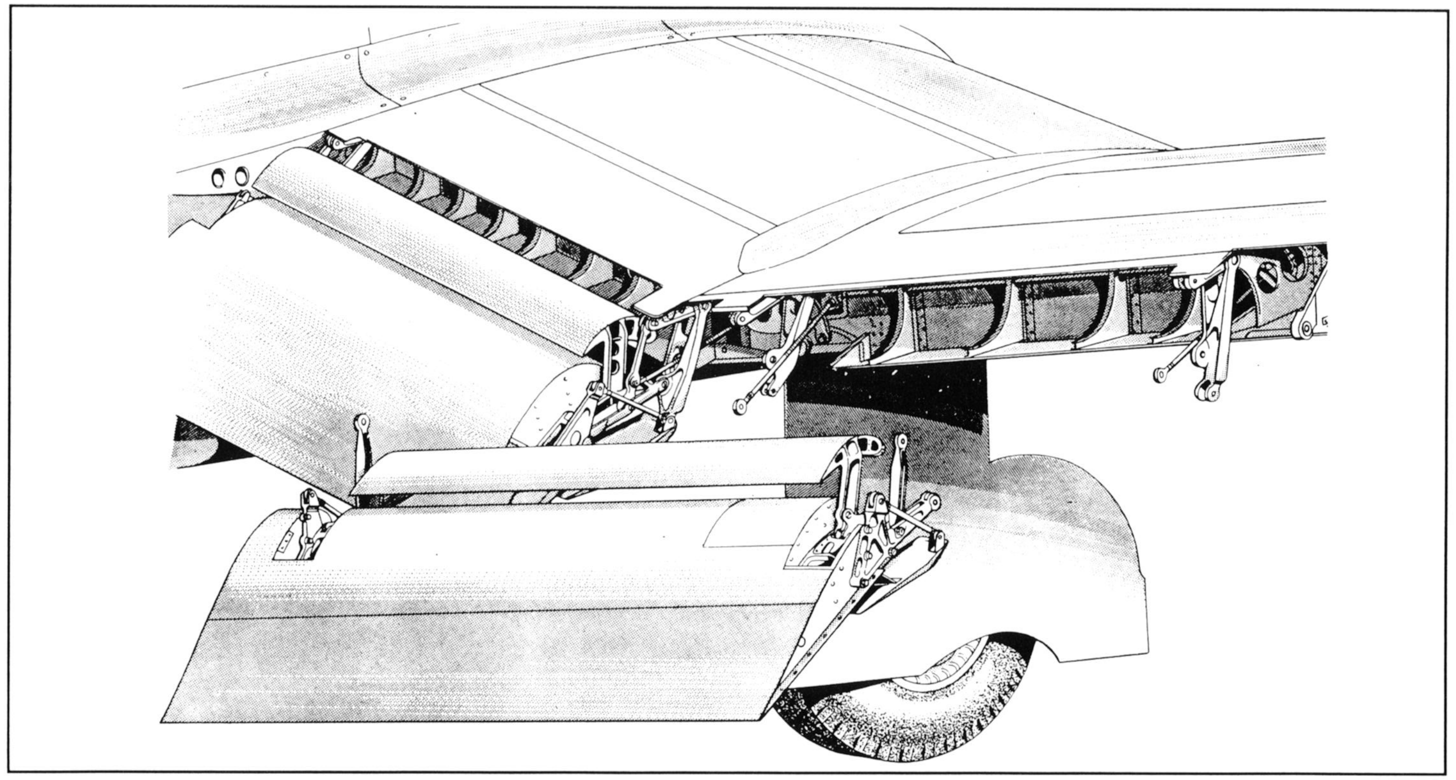


TOP VIEW OF BTD-1 IN 1/72 SCALE

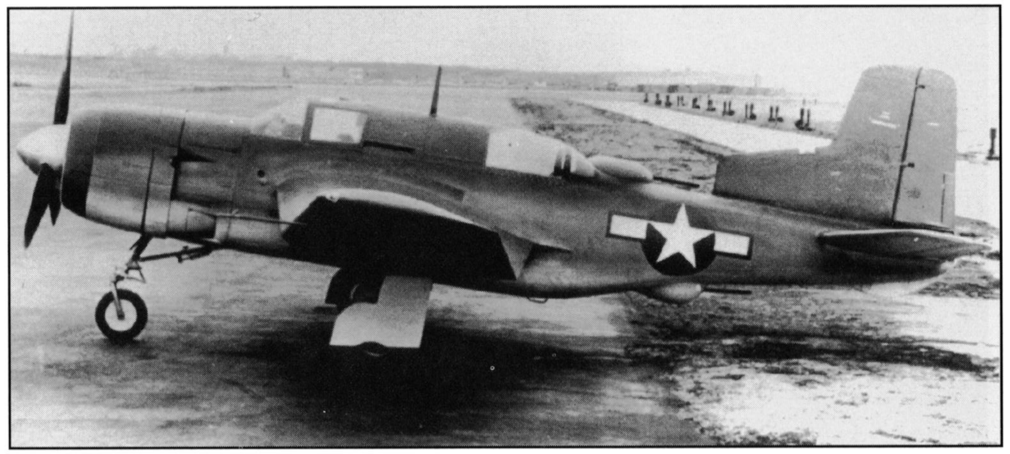


XSB2D-1 & BTD-1 INBOARD AND OUTBOARD WING FLAP INSTALLATION





THE BTD-1 DESTROYER

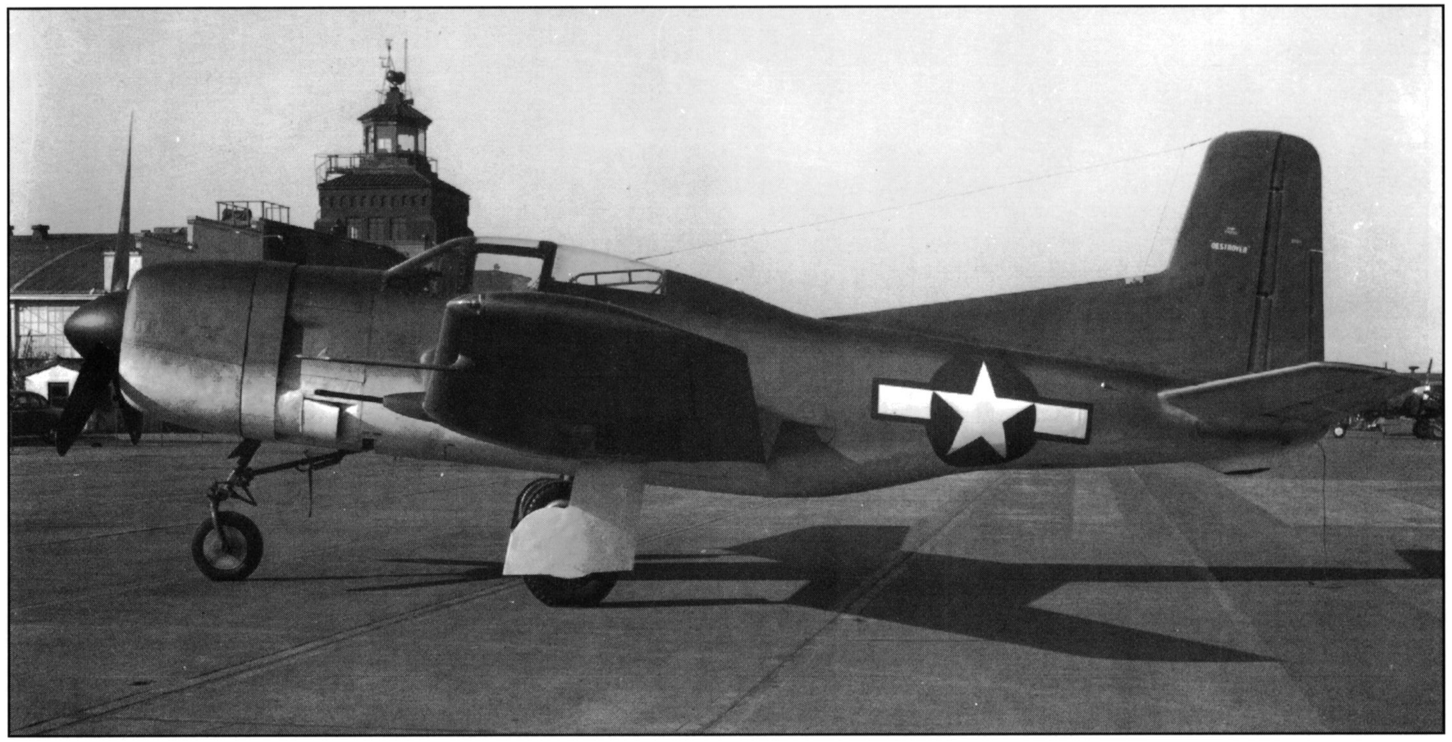


In order to save the XSB2D-1 project, Douglas was allowed to redesign the XSB2D-1 into a single-seat configuration, known as the BTD-1 "Destroyer". The date of that first contract, 9 April 1942 was, before the battles of the Coral Sea and Midway and indicates an early awareness of the inefficiency in using rear defensive guns on carrier aircraft. This inefficiency was vividly demonstrated in 1940 when the seemingly invincible JU-87 Stukas of the German Luftwaffe were mauled by the fighters of the RAF during the Battle of Britain.

Although the turret guns and the second crew member station were deleted from the design, the BTD-1 was still powered by the R-3350 engine and continued to use the tricycle landing gear, two 20mm wing guns and internal bomb bay. And, like the XSB2D-1 before it, the BTD-1 continued in search for a more effective dive brake.

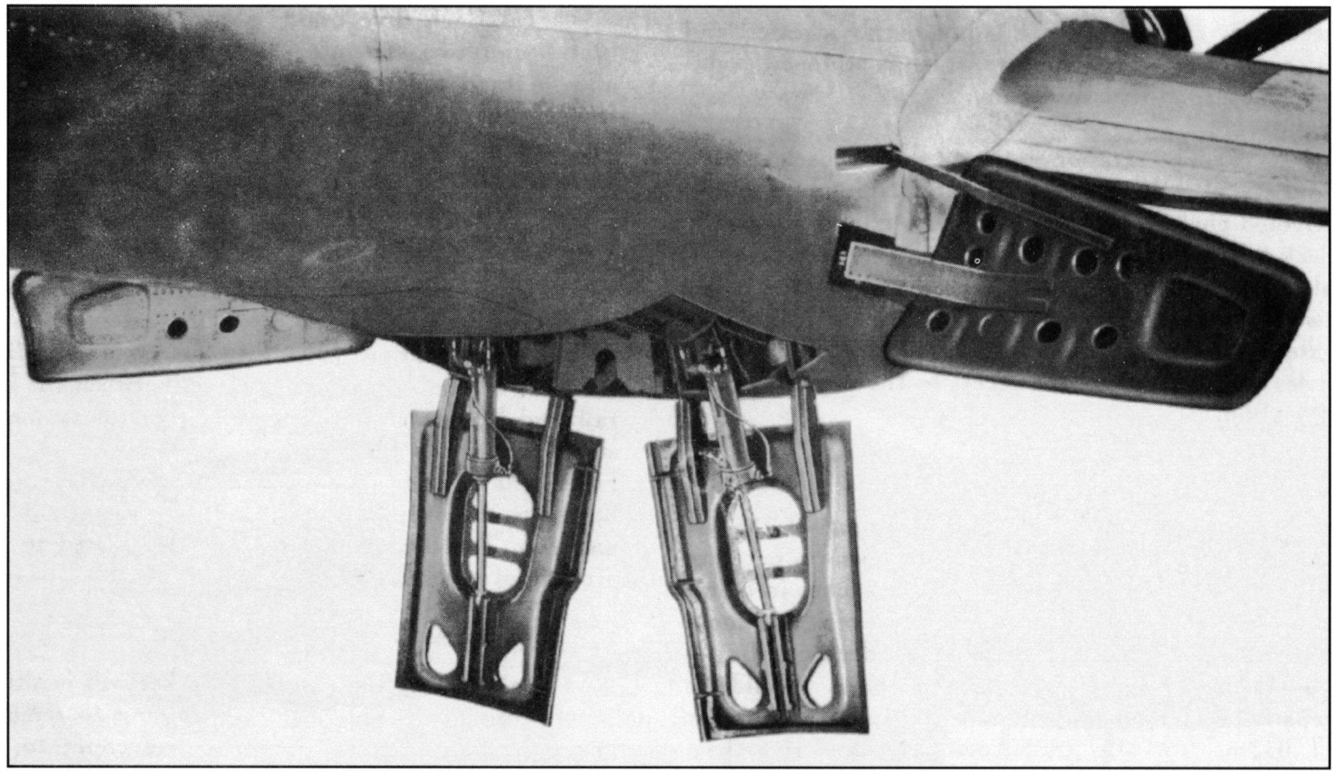
The dive brakes used by the first BTD-1s were the same wing picket fence panels that were developed on the XSB2D-1. Like the XSB2D-1, the first BTD-1s were built without any fuselage dive brakes. But, by 9 June 1944, the fuselage dive brakes tested on the XSB2D-1 were refined and

Photo above shows a side view of the XSB2D-1 and should be compared with the side view of BTD-1 04967, seen below on 12-8-43. Minimal exterior changes were employed in the conversion from a two-seat scout to that of a single-seat torpedo and dive bomber. After removal of the guns, the turtledeck was shortened and redesigned to allow the dorsal fin to be extended forward until it joined the fuselage. The height of the vertical tail was increased by 10.5 inches and the horizontal stabilizer length was increased by 24.9 inches. The outer wing dihedral was decreased from 14° to 10° which resulted in a wingspan increase of 2.6 inches. (via Wayne Morris)



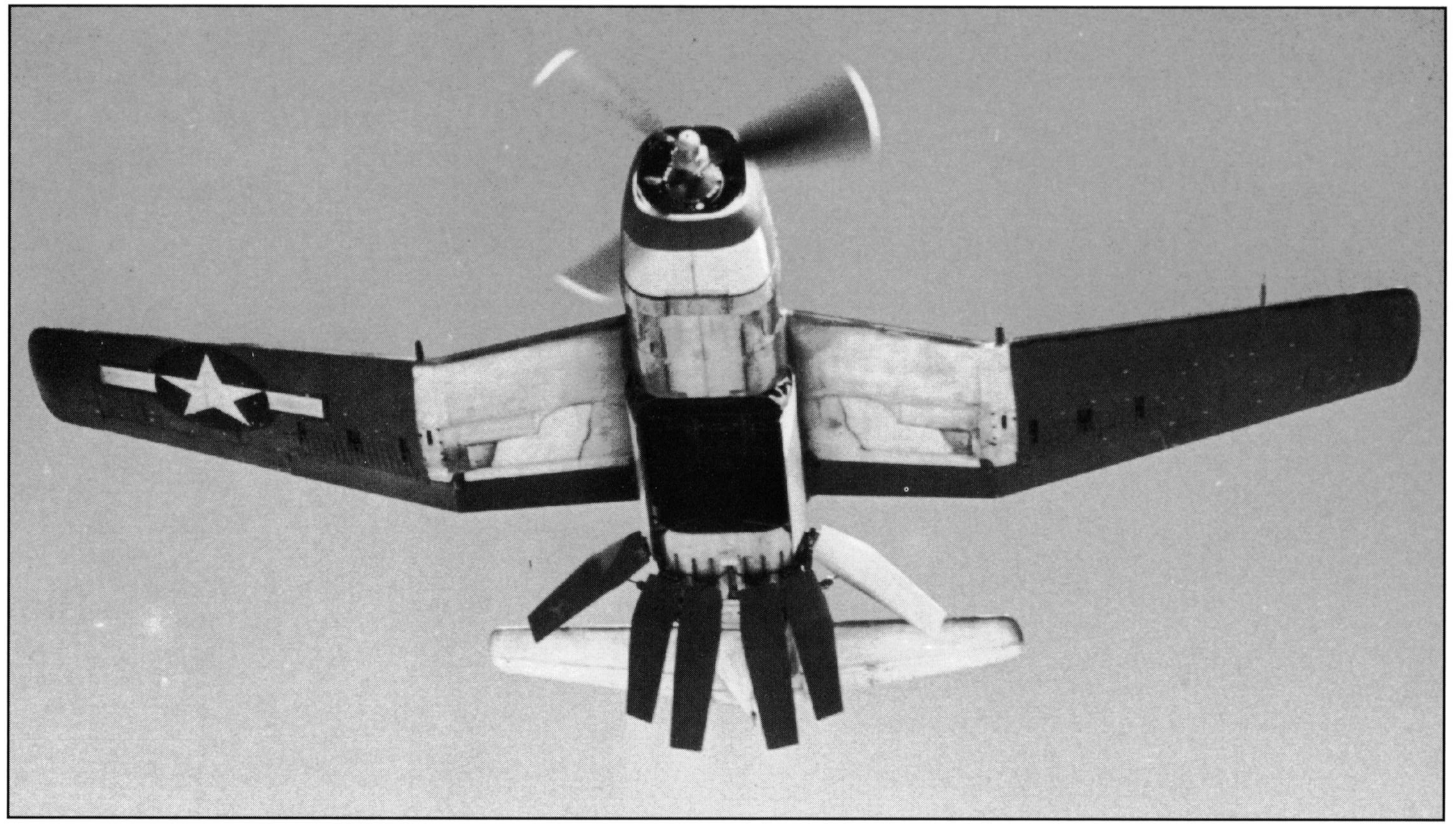
installed on BTD-1 04967 (see page six). Combined with the wing picket fence dive brakes, these advanced fuselage panels were designed as part of the fuselage and consisted of two solid side panels and two lower panels equipped with five perforations per panel. This reduction in the use of perforations could be a sign that any buffeting encountered with the test fuselage dive brakes fitted to XSB2D-1 BuNo 03551 was less than anticipated. This combination fuselage-and-wing dive brake system was the definitive production version, with the fuselage panels being retrofitted to most of the earlier BTD-1s.

Above and below, BTD-1 BuNo 04967 as fitted with the definitive wing-and-fuselage dive brake system on 6-9-44. The interior of the dive brakes and their wells were painted red. The opening behind the lower fuselage dive brakes was for the fuselage lower access door. Cowl stripe behind the prop is red. (MFR)



The ultimate version of the BTD-1 dive brake was tested on the prototype BuNo 04959, and consisted of a combination of inner-wing flap panels and six-finger, solid fuselage panels. In this configuration, the use of wing flaps allowed a cleaner upper wing surface, which helped restore the efficiency of the laminar airfoils. Moreover, since the fuselage panels were again increased in area, their effectiveness was beginning to be better utilized. Since the XBT2D was already on order (June 1944), there

Above, closeup of the fuselage dive brakes. The side fuselage dive brakes have no wells, but instead retract flush against the fuselage. Below, 04959 with the six-finger, solid fuselage test dive brakes deployed and its enormously wide bomb bay open. The prop dome and wing cannon have been removed for these tests. (MFR)



At left above, the inner wing-flap dive brake as tested and installed on 04959 on 7-21-44. Compare the shape of these flaps to those in the drawings on page 26 and note that a center hinge has been added on the wing-flap dive brake. This BTD-1 has the non-standard plexiglass hatch installed in the aft turttledeck. Also note how the pilots canopy scissors up and aft to clear the rear fuselage. The extended cockpit entry step i9s visible aft of the flap. (MFR)
At left below, a ground test of the externally mounted six-finger flaps on 04959 on 9-22-44. (MFR)

was no reason to retrofit this dive brake combination into the BTD-1s. This type of wing flap-dive brake functioning was incorporated in the XTB2D-1 "Skypirate", while the solid fuselage panels lead us right to the "barn doors" of the Douglas "Skyraider".

The large spinner and tight-fitting cowl that enclosed the R-3350 contributed to a "rounded-square" look. The spinner was used to increase the flow of air to meet the anticipated cooling needs of the engine. The upper corners of the engine cowl were occupied by the carburetor air scoops, while the lower corners were used by the oil cooler air scoops. At first glance it would appear that this large, squarish cowling would block the pilot's view of the LSO. But because of the characteristics of its high-lift flaps, the airplane's nose attitude was somewhat lower than that of similar airplanes, which in turn might have enabled the carrier pilot to see the LSO over the BTD-1's nose.

The R-3350 powered a three - bladed Hamilton Standard Hydromatic propeller with a diameter of 12 feet 8 inches and was equipped with a two-speed, single-stage supercharger for high-altitude operations. The takeoff power setting of 48.5 inches Hg and 2,800 rpm was used to produce the rated 2,000 bhp. The MAP setting is low by comparison with the later models of the R-3350,

Below, eight of the original BTD-1s under construction at El Segundo on 1-1-44. The BuNos of the aircraft from front to back are: 04960, 04962, 04963, unknown, unknown, 04967, 04968, unknown. The second aircraft, 04962, was one of two aircraft built as XBTD-2s with a J30 jet engine in the tail. Note the difference in the dorsal fin and rear fuselage when compared to 04960 in the foreground. Note the picket fence frame and the wing wells they retract into. The early BTD-1s did not have fuselage dive brakes as illustrated here. (MFR)

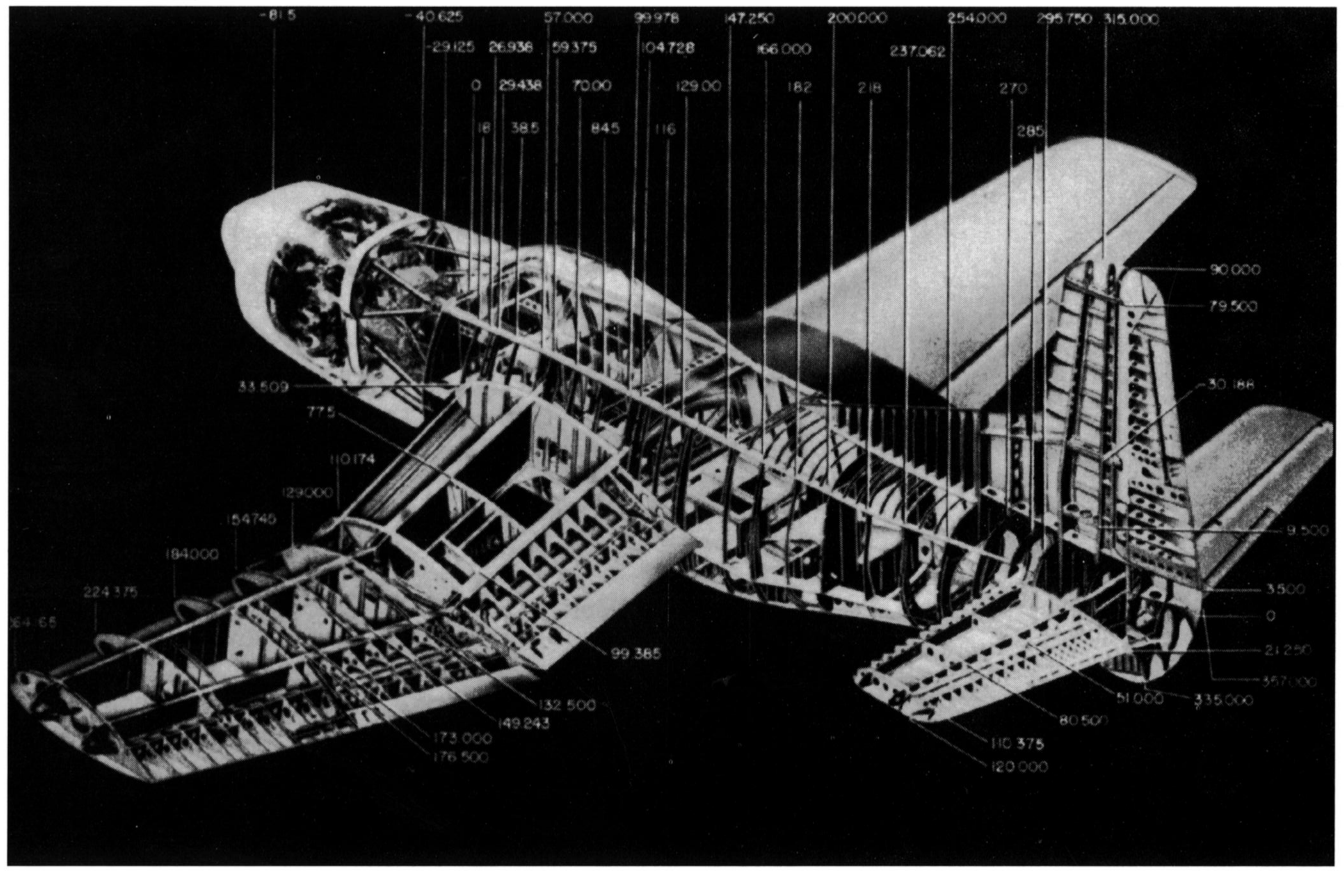
but the engine was in the early stages of its development cycle and the fleet was still using 100/130 avgas. The cockpit instrumentation contained the standard power setting combination of MAP and RPM gauges to which a BMEP (Brake Mean Effective Pressure) gauge was added. The BMEP gauge would indicate the actual power output (in psi however, and not Brake Horse Power) of the engine. Its use could help spot deteriorating engine performance before a catastrophic failure occurred, but the BMEP gauge was not installed on later generations of prop-driven carrier-planes.

The flight controls were of a conventional type, being cable operated with a controllable trim tab on each flight surface. This long proven system was both light weight and maintenance free. But, except for the electrically operated wing flaps, just about everything else was hydraulically powered. The hydraulic system operated engine cowl flaps, wing-fold mechanism, the landing gear and its doors and brakes, arresting hook, bomb bay doors, bomb-displacing gear, dive brakes, gun chargers and automatic pilot. All controls, except for the wing-fold mechanism and landing gear, were required to be placed in the neutral ("OFF") position after the operation had been completed. Although this step reduced the amount of hydraulic line that was under pressure, thereby minimizing the chances of a leak occurring, it certainly added to the pilot's workload. The source of power for the system was two engine-driven pumps, plus a hydraulic hand pump as a backup source of power.

The requirement for a wing and tail de-ice system was complicated by the requirement for the use of a laminar airfoil. The standard de-icer system of the time was vacuum-operated with rubber boots. But the installation of the rubber boots would have interfered with the airflow, negating any beneficial gain from a laminar flow airfoil section. The more advanced de-icer system used a heater and associated plumbing to route the heated air through the airfoil's leading edges, and was the heavier type of de-icing system. Of course, any increase in weight carried along with it a reduction in the airplane's performance. This de-icer system requirement proved to be an unnecessary one for the World War Two carrier war in the Pacific, and was deleted from the BTD-1. In later circumstances, as the need for winterized variants arose to meet the weather conditions of their theater of operations (Korea), specific airplanes were modified and so designated by "L" as the winterized suffix. Two examples were the F4U-5NL and AD-4NL, both of which used conventional airfoil sections and so were able to use the relatively simple, vacuum-operated, rubber boot de-icer system.

With the elimination of the gunner and his remote turrets, room became available for the installation of another 130 gal. fuel tank in the fuselage. This aft fuselage tank became the reserve tank, and was

BTD-1 STATIONS DIAGRAM

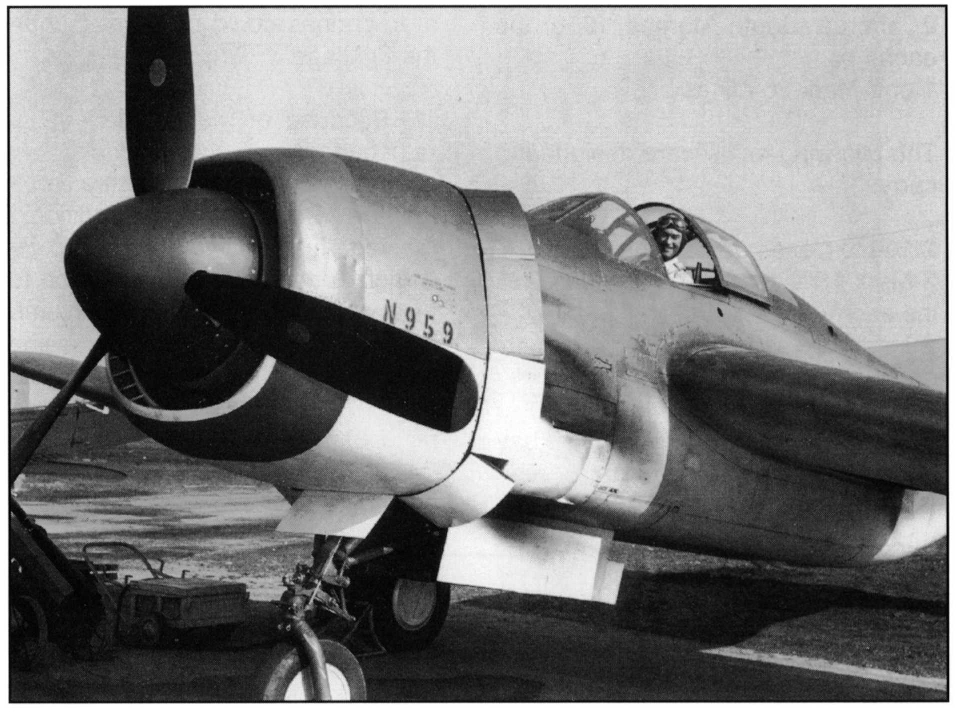


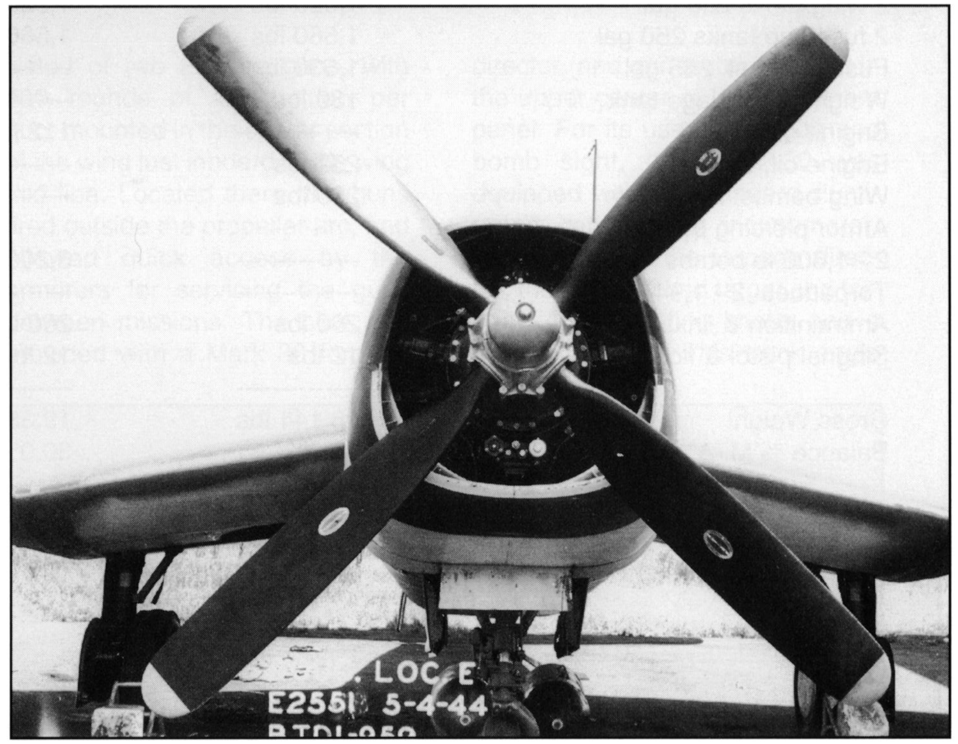
normally used for takeoffs, bombing attacks and landings. The main fuel system then was composed of two 130 gallon fuselage tanks and two 110 gallon wing tanks for a total capacity of 480 gallons of internal fuel.

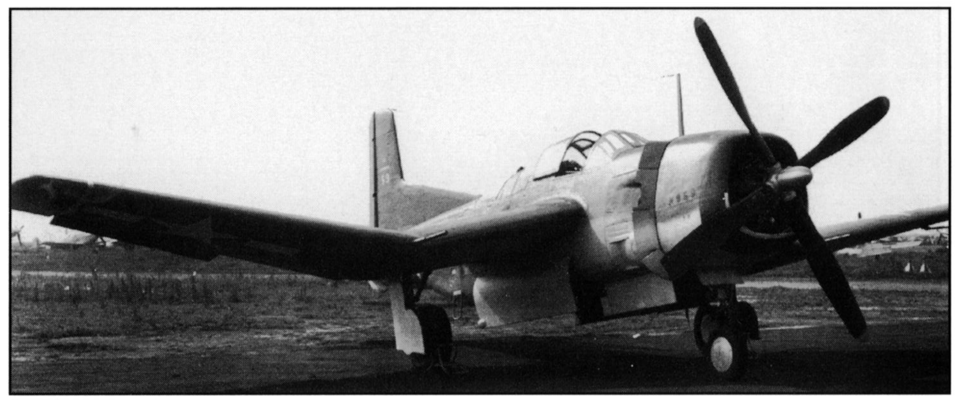
The additional fuel needed for scouting missions was obtained by installing a 255 gallon, or either one or two 100 gallon droppable tanks, in the bomb bay. If the mission required just 100 additional gallons of fuel, and the right hand droppable tank was installed, a left hand bomb could be carried. Otherwise, when the 255 gallon or both 100 gallon tanks were carried, only the wing-mounted ordnance could be carried. To manage this fuel system, the pilot had a fuel tank selector with six positions and an auxiliary pump. This type of multi-tank fuel system, although the standard for its day, was complicated enough to be considered as the cause of too many accidents, so future generations of naval airplanes would use simpler-to-manage fuel systems.

The ordnance loads that could be carried by the BTD-1 were revised by the substitution of a mine-laying capability for the smoke-laying requirement and included a heavier aircraft depth bomb. The two bomb bay racks were designed to carry the following:

1 or 2 500 lb class bombs, or
1 or 2 1,000 lb class bombs (GP), or
1 or 2 1,600 lb class bombs (AP), or
2 Mark 18 aircraft depth bombs (325 lbs each), or







Above right, test pilot Laverne Browne in the cockpit of BTD-1 BuNo 04959 on 15 February 1944. This is the standard three-bladed 12' 8" Hamilton Standard Hydromatic propeller. Cowl stripe is red. At right middle, 04959 on 5-4-44 during testing of a four-bladed Hamilton Standard propeller. Two bombs are sitting on the ground below the bomb bay. At right bottom, 04959 during testing with a Curtiss 13' 2" prop installed. Note thin white wing stripe between the aileron and the wing tip. (MFR)

2 aircraft depth bombs (650 lbs each), or
1 or 2 Mark 36 mines

The two wing racks were designed to carry:

2 100 lb class bombs, or
2 Mark 18 aircraft depth bombs (325 lbs each), or
2 incendiary bomb clusters (100 lbs each)

With the removal of the bomb bay doors and installation of the torpedo fairing, 1 or 2 Mark 13-1 or 13-2 aerial torpedoes could be carried under the fuselage.

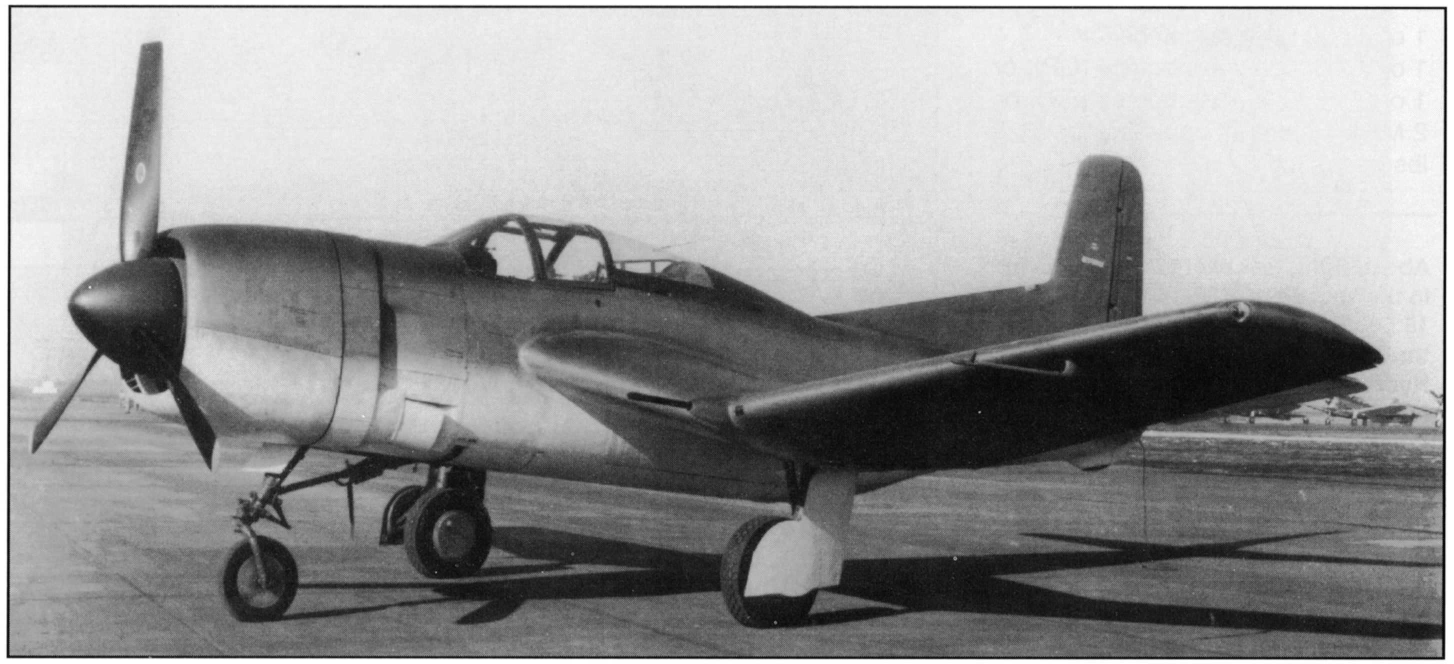
Because of the deletion of the rear gunner and turrets, the BTD-1 could have been significantly lighter that the XSB2D-1. But the addition of the rear fuselage fuel tank into the design added back about 900 lbs (of fuel, its tank and associated plumbing), which offset most of the weight savings. From the pilot's handbook:

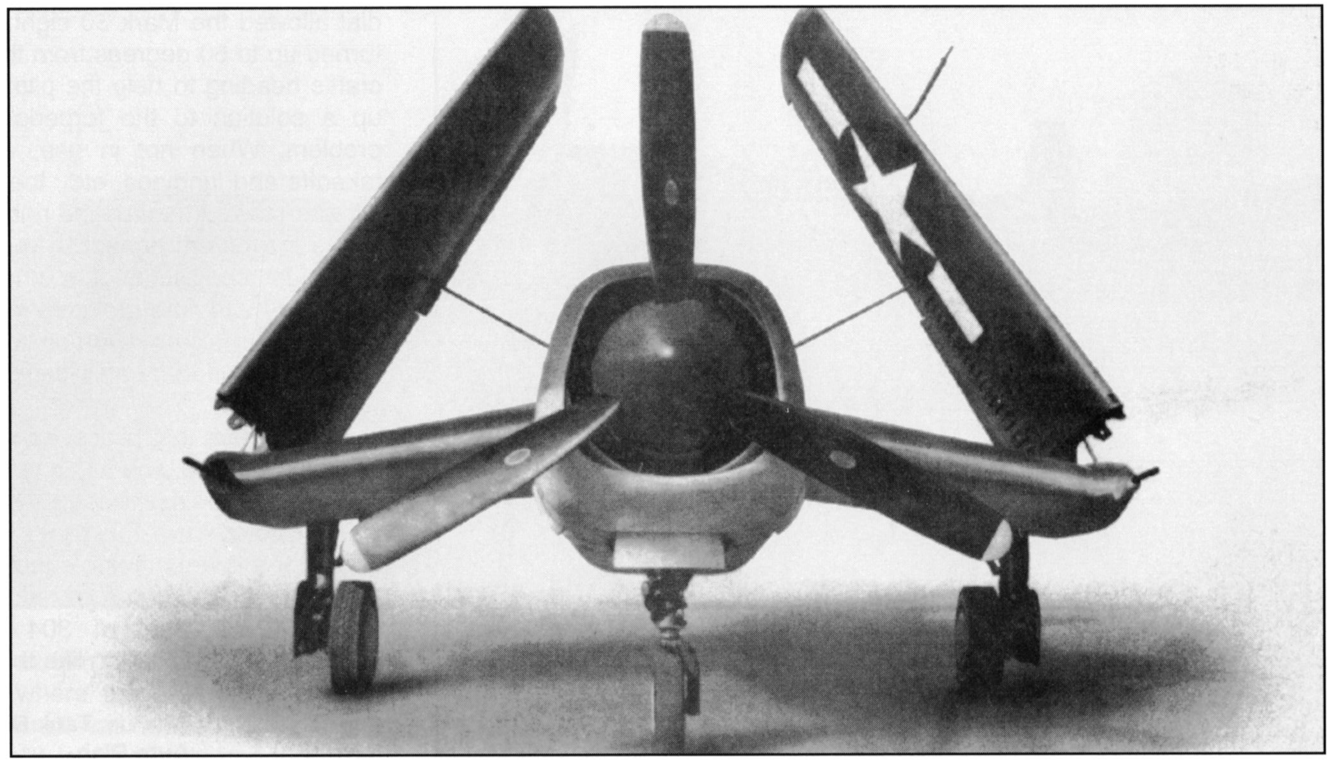
Maximum Catapult Weight, 19,000 lbs.
Maximum Landing Weight (normal) 17,500 lbs.
Maximum Landing Weight (controlled conditions) 19,500 lbs.

Although the following table doesn't list all the possible combinations of ordinance that could be carried, it is included to show representative combat configurations and weights for the BTD-1. Furthermore, because of the developmental status of the airplane, this data was subject to change and should not be considered as definitive.

The forward firing armament con-

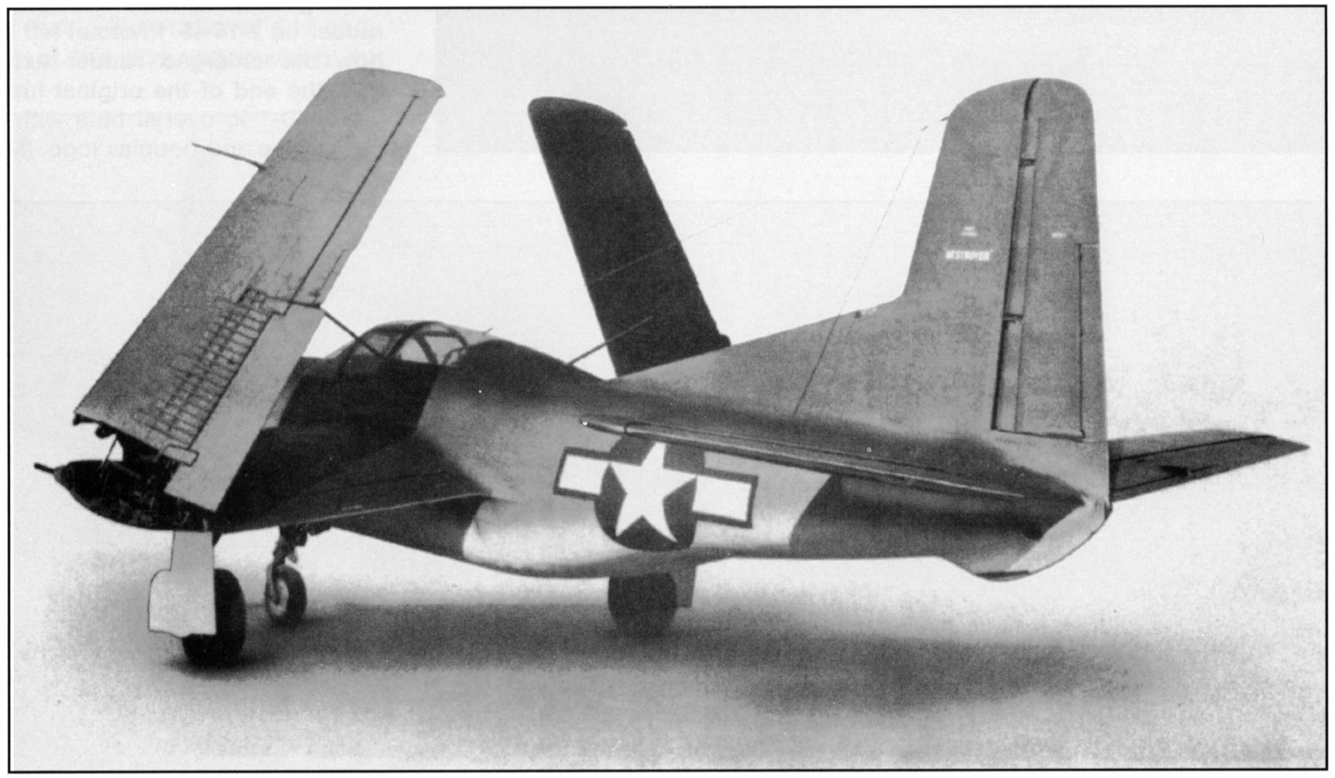
BTD-1 MISSION BALANCE, 27.0% M. A. C. BASIC WEIGHT,	OVERLOAD` SCOUT BOMBER	2 - 1,600 AP DIVE BOMBER	2 - TORPEDOES TORPEDO BOMBER
Airframe plus pilot:	12,900 lbs	12,900 lbs	12,928 lbs
Fuel (6 lbs /gal):	735 gal	480 gal	480 gal
2 wing tanks 220 gal	1,320 lbs	1,320 lbs	1,320 lbs
2 fuselage tanks 260 gal	1,560 lbs	1,560 lbs	1,560 lbs
Fuselage tank 255 gal	1,530 lbs	--------------	--------------
Weight of fuselage tank	130 lbs	--------------	--------------
Engine oil, 15 gal	--------------	112 lbs	112 lbs
Engine oil, 31 gal	232 lbs	--------------	--------------
Wing bombs: 2 100 lbs	200 lbs	--------------	--------------
Armor piercing bombs:			
2 - 1,600 lb bombs	--------------	3,200 lbs	--------------
Torpedoes: 2 - 1,947 lb	--------------	--------------	3,894 lbs
Ammunition & links	260 lbs	260 lbs	260 lbs
Singnal pistol & float lights	12 lbs	12 lbs	12 lbs
	--------------	--------------	--------------
Gross Weight	18,144 lbs	19,364 lbs	20,086 lbs
Balance % M. A. C.	28.0%	30.0%	24.0%

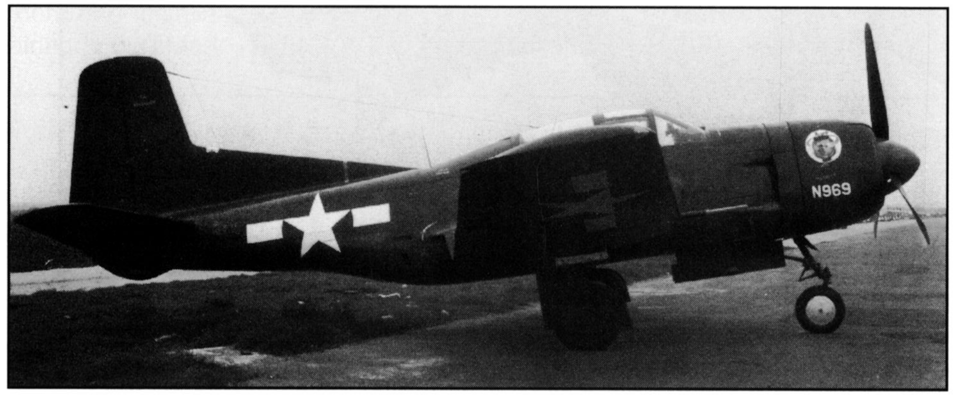


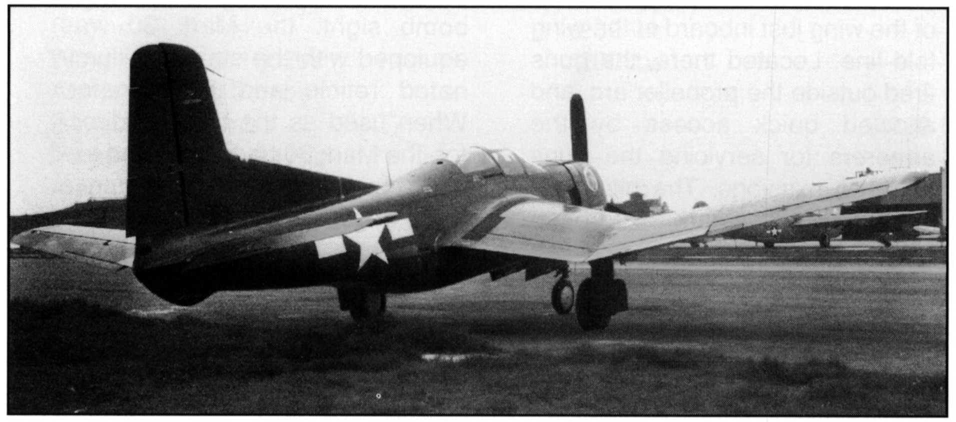


At left, the first BTD-1 on 12-8-43 in the mid-war years' tri-color paint scheme. The prop spinner was dark blue as was the nose gear. The wheels were natural metal. Above, head-on view of the BTD-1 with the wings folded and the wing braces in place. Below, left rear view of the BTD-1 with the wings folded. (MFR)

sisted of two 20 mm guns, with 200 rounds of ammunition per gun, mounted in the center section of the wing just inboard of the wing fold line. Located there, the guns fired outside the propeller arc, and allowed quick access by the armorers for servicing the guns between missions. The pilot was provided with a Mark 30 torpedo director (and gun sight) installed in the upper center of the instrument panel. For its use as the gun and bomb sight, the Mark 30 was equipped with the standard illuminated reticle and inclinometer. When used as the torpedo director, the Mark 30 had target and torpedo speed setting knobs and a track angle dial. This track angle







dial allowed the Mark 30 sight to be turned up to 60 degrees from the aircraft's heading to help the pilot work up a solution to the torpedo firing problem. When not in use, as for takeoffs and landings, etc., the Mark 30 was stowed against the right side of the instrument panel. An auxiliary gun sight consisting of a ring and post-and-bead was provided in case the bullet-resistant portion of the windshield suffered battle-damage.

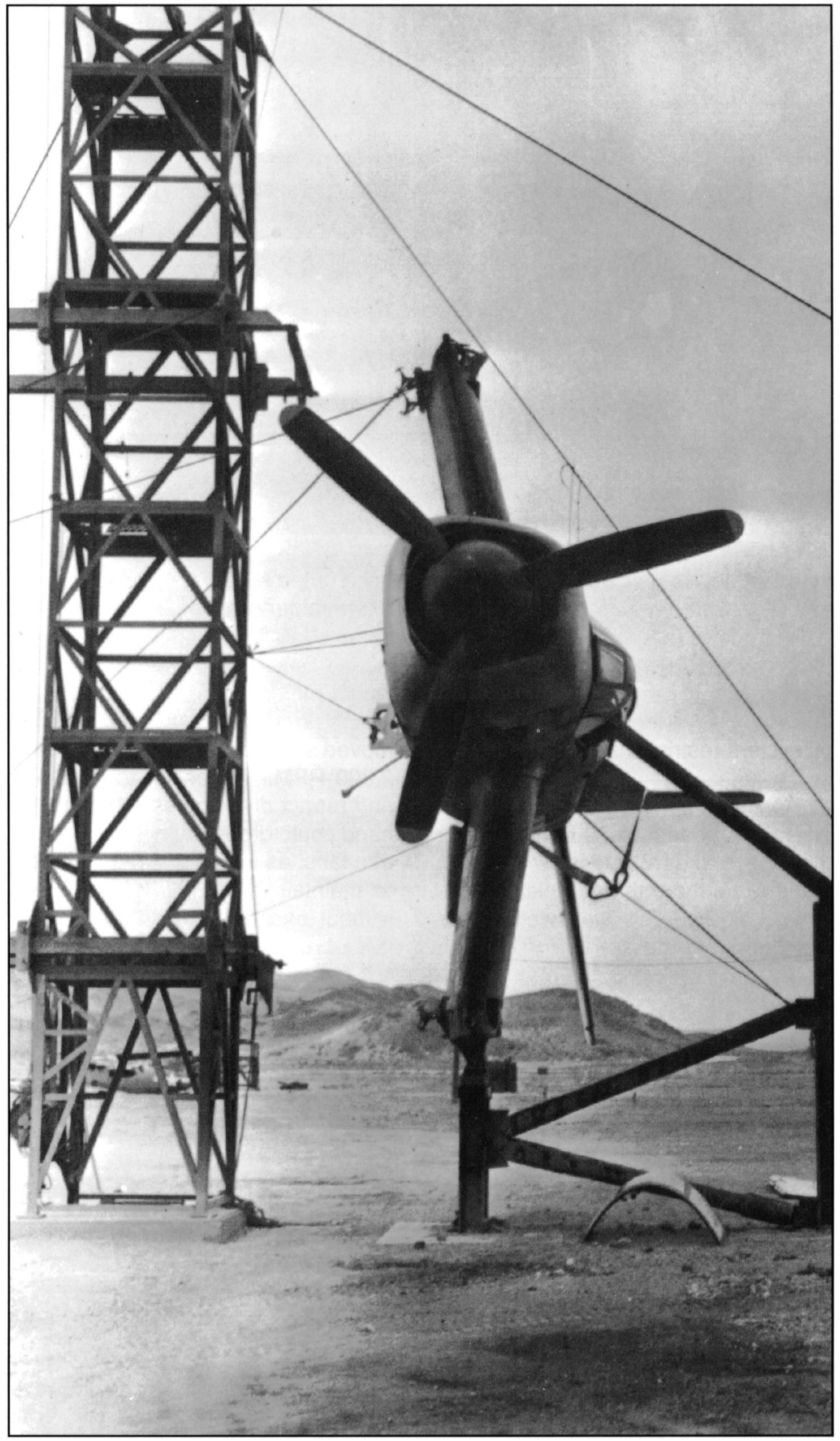
Based on the pilot's handbook "diving" check list and airplane limitations, the BTD-1's procedures (tactics weren't covered in the pilot's handbook) for a dive bombing attack from 15,000 feet (where the max airspeed above 12,000 feet of 304 knots applied) went something like this:

Fuel Selector:	**Aft Fus. Tank Res.**
Mixture:	**Auto Rich**
Supercharger:	**Low Blower at any Altitude**
Cowl Flaps:	**Close**
Carburetor Air:	**Direct**
Oil Cooler Doors:	**Close**
Trim Tabs:	**Check (see below)**
Aux. Fuel Pump:	**On**
Bomb Doors:	**Open**
Dive Brakes:	**Open (Max 348 kts)**

The BTD-1 (04969) in its final form with fuselage dive brakes and extended rudder on 2-14-45. Photo at left shows how the enlarged rudder extended past the end of the original fuselage. The BTD-1 is overall blue with a red cowl stripe and Douglas logo. (MFR)

The trim tabs were set for that point where the greatest control of the aircraft was needed (pilot's handbook: "It is practically impossible to set the tabs correctly after a dive is initiated"). That point probably occurred just prior to bomb release and where, because of the high speed and low engine power, left rudder would be needed to make the vertical stabilizer possessive: stabilizer's 2 degrees of port offset. The propeller was set to 2,200 rpm to insure satisfactory oil scavenging from the engine, and the throttle reduced to 15 - 20" Hg. This MAP setting was maintained during the pushover and early stages of the dive, after which the throttle could be closed without the engine overspeeding (limit 3,000 RPM). For its entry into the dive, the airplane could be rolled inverted. All other inverted flight maneuvers were not permitted due to engine fuel and oil system restrictions.

Once established with the bomb bay doors open in a 70 degree dive, the dive brakes would slow the airplane to no more than 280 knots terminal velocity. This was well within the 455 knot design diving speed limit, and 348 kts IAS, the max speed below 12,000-feet limitation. The target could be tracked through the Mark 30 sight, whereby using the rings of the reticle and the ball (in the inclinometer), the aiming point for the bomb's release could be determined. After "pickling" the bombs, the pilot would pull back on the control stick with his right hand while his left hand moved swiftly to increase the RPM to 2,800 RPM, add power to 48.5" Hg, and retract dive brakes. Then his left hand could drop down to the elevator trim tabs, as the pullout required care to maintain a steady rate of pullup without exceeding the max G force (Max Load Factor at 16,000 lbs was 6.3 G, and it decreased linearally to 5.5 g at 18,000 lbs). After pulling-out, the dive brake control was placed in neutral, the bomb bay doors, closed

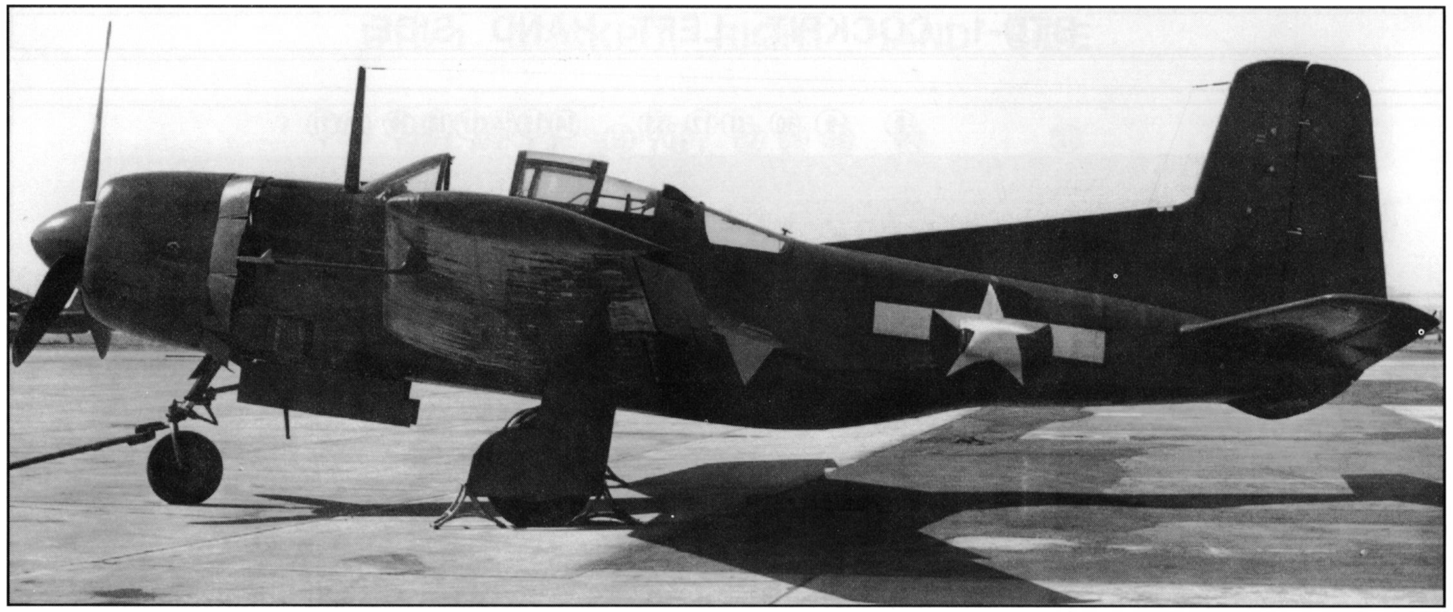


At left, a BTD-1 on 28 May 1945 was mounted out in the California desert for rocket firing tests. (MFR)

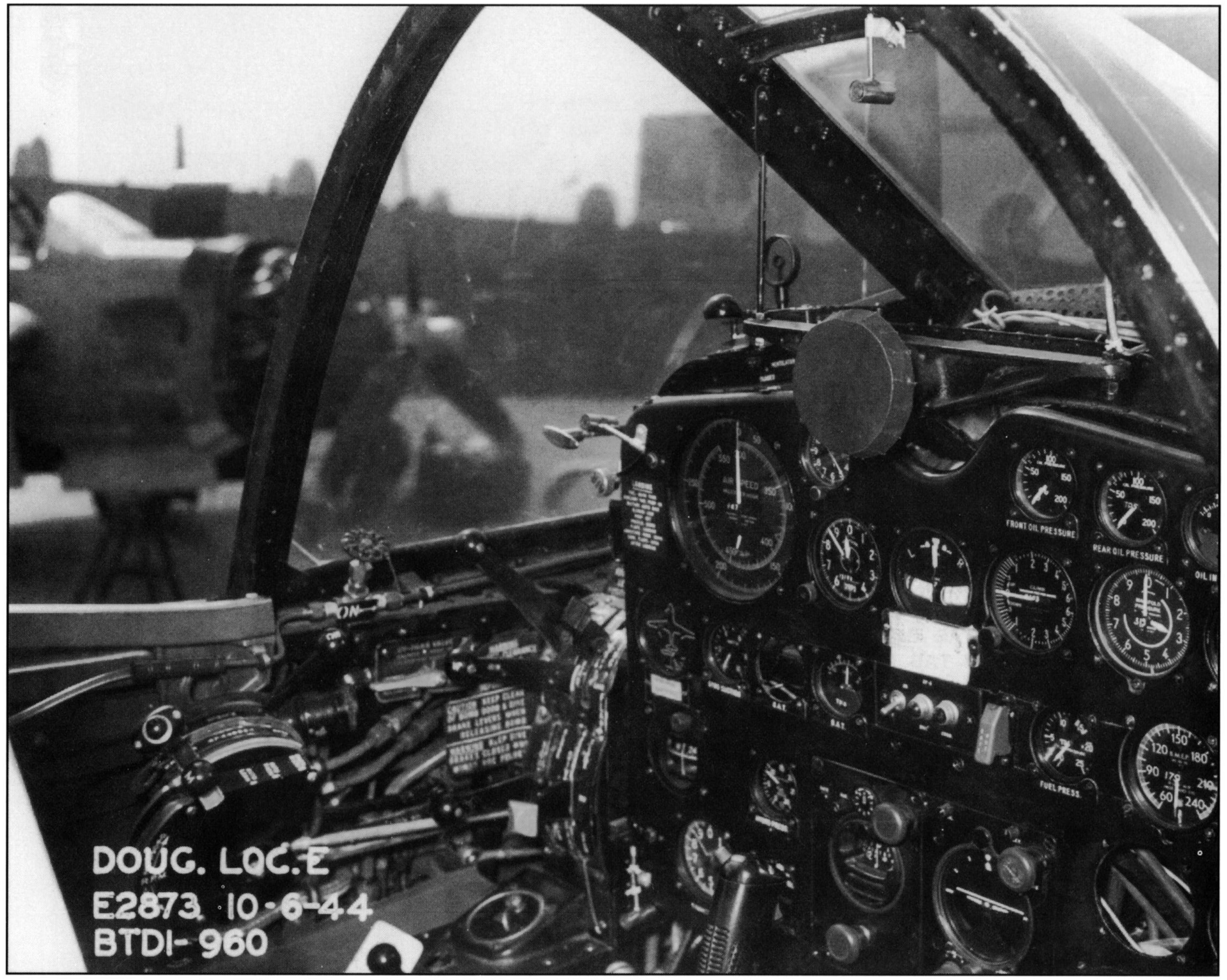
and, when discretion permited, power reduced.

During this axial-deck era of carrier aviation, the pilot flew a flat, power-on approach to the ship. For the BTD-1 returning from a mission, the airplane weight would have been about 16,000 lbs, at a carrier approach speed of 82 knots. If the LSO gave him the "cut", the pilot chopped the power and pushed the aircraft's nose over. Three-to-four seconds later (depending on cut altitude and wind-over-the-deck), he pulled the stick back to get the aircraft into a tail low attitude. With this nose-wheeled airplane, too little rotation could result in the nose wheel striking the deck first. That would either overstress the nose gear assembly or cause a bounce that could end up in a barrier engagement. To assist the pilot in controlling the attitude of the airplane during this flare, the mechanical advantage shift was installed. When the wing flaps were lowered, this mechanical advantage shift automatically moved the control stick forward. This shift effectively created more up elevator travel in the landing configuration, and helped the pilot attain the desired touchdown attitude, another example of the demands the designer had to overcome in creating a "good" carrier airplane.

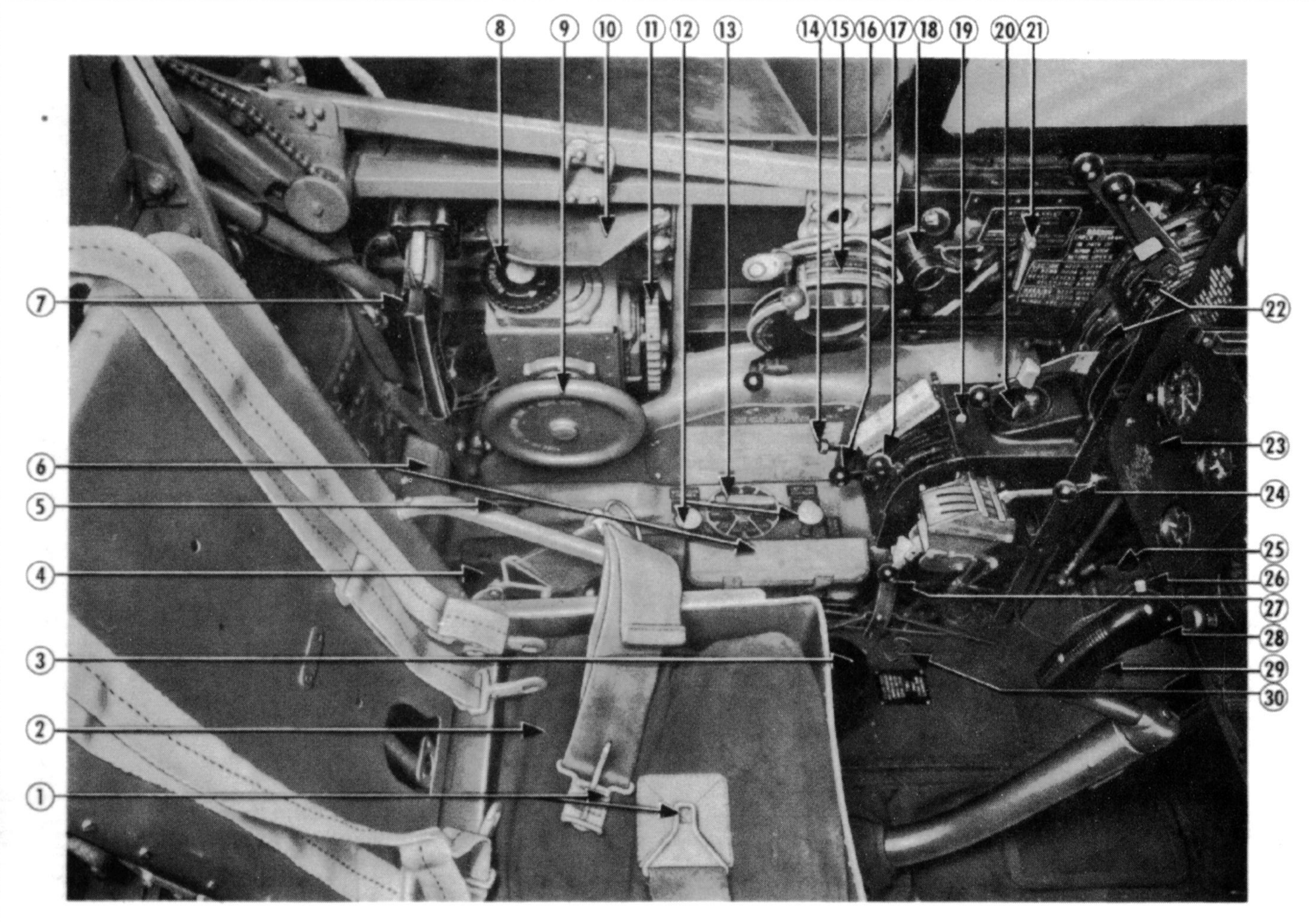
By 1943, the lessons of carrier-verses-carrier battles were being applied by the Navy to their next generation of combat airplanes. The Navy issued contracts to three aircraft manufacturers (Martin, Fleetwings and Curtiss) for its next generation of Bomber Torpedo airplanes. The BTD-1 was the first of this class of airplanes to fly, making its first flight on 5 March 1944. Although it demonstrated better flying characteristics than its predecessor, the BTD-1 still used many of the XSB2D-1's components and suffered from poorer performance estimates than the Martin and Kaiser-Fleetwing sdesigns. All of which leads to that momentous June 1944 meeting with the Navy, where Ed Heinemann proposed cancelling the BTD-1 to use the remainder of that program's funding for a new design that he had been considering. This design would carry its bomb load externally, have simple, maintainable systems, and be powered by the Pratt & Whitney R-2800 engine. The Navy, once again,insisted on the use of the more powerful Wright R-3350 engine and, after that famous overnight design session, allowed the redesign of the Douglas Skyraider, whose history is beyond the scope of this story.



Above, BTD-1 04971 on 5-15-45. This Destroyer was built with the plexiglas turtledeck hatch, and a radio mast installed forward of the cockpit. Note that a cooling scoop has been added to the aft fuselage in the center of the national insignia. Below, cockpit photo of BTD-1 04960 on 10-6-44. (MFR)

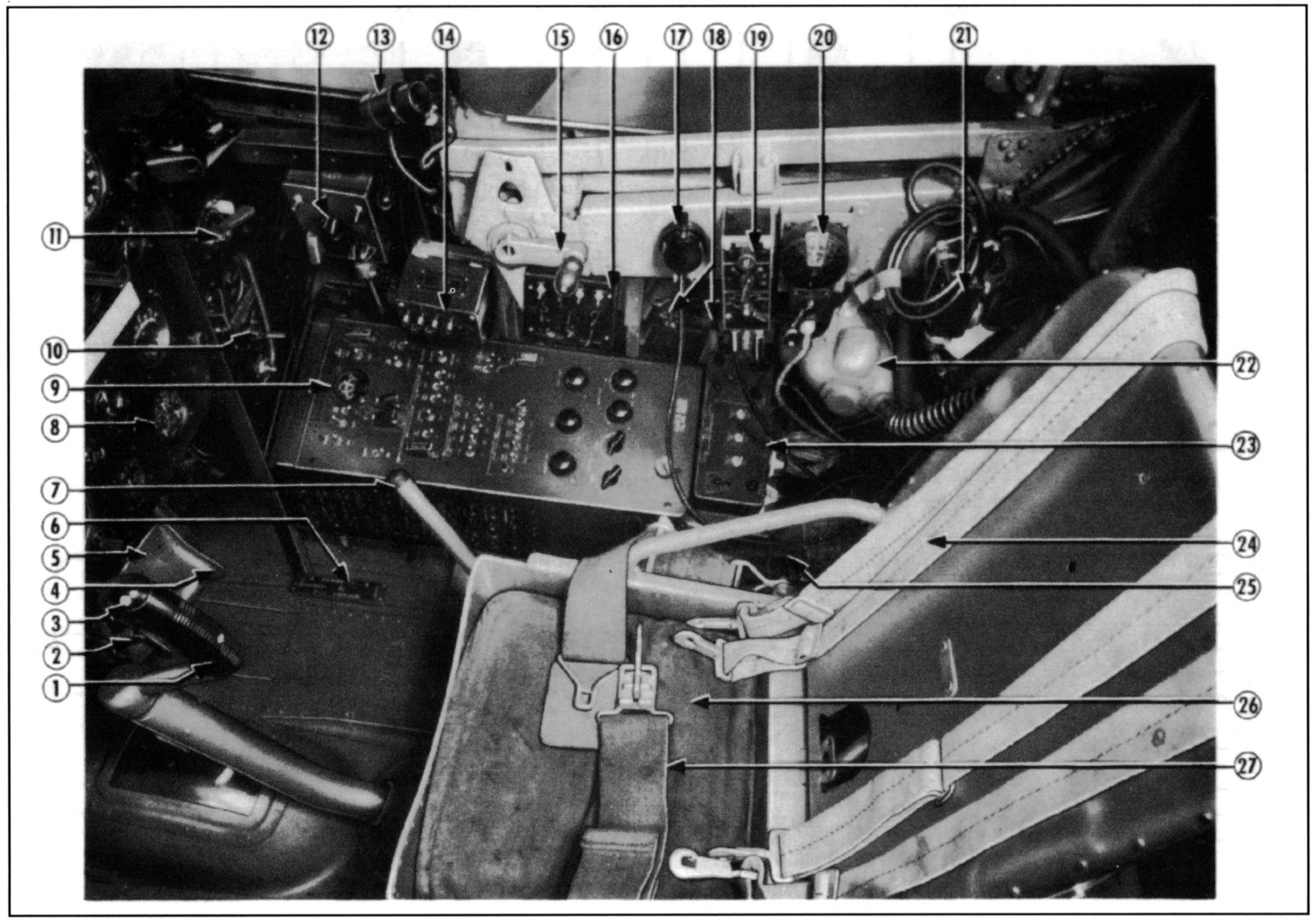


BTD-1 COCKPIT, LEFT HAND SIDE



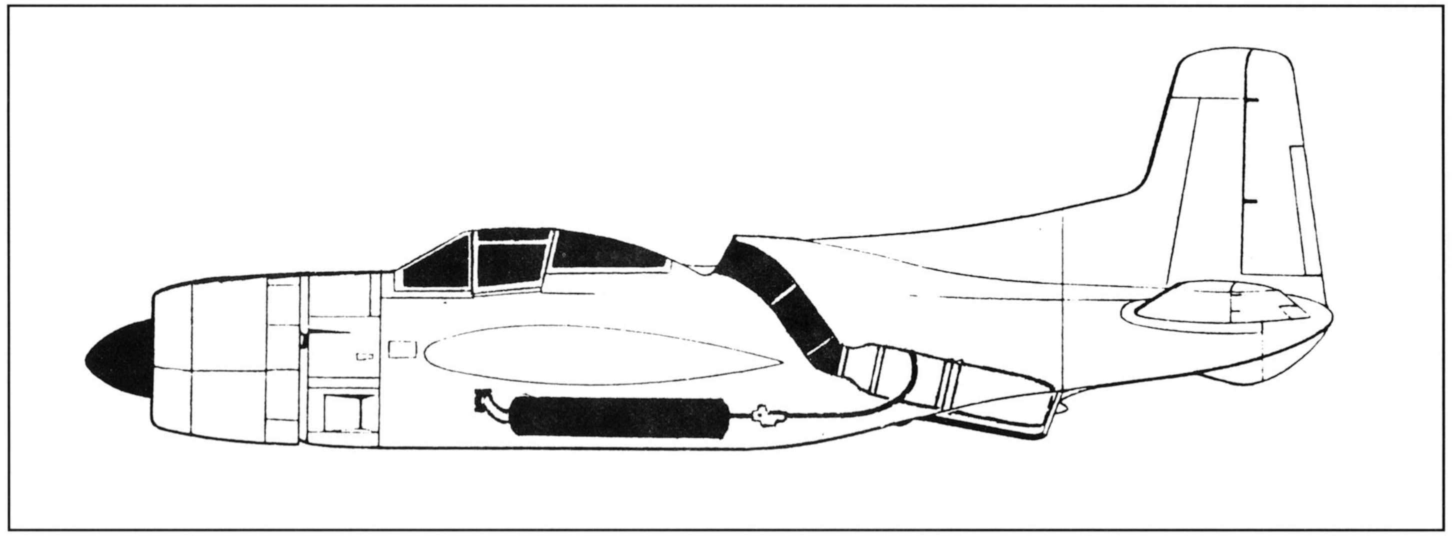
1. SEAT STRAPS
2. PILOT'S SEAT
3. RELIEF CONTAINER
4. MAP CASE
5. TOW TARGET RELEASE
6. SIGNAL PISTOL CARTRIDGES
7. SIGNAL PISTOL
8. RUDDER TRIM TAB CONTROL
9. ELEVATOR TRIM TAB CONTROL
10. ARM REST
11. AILERON TRIM TAB CONTROL
12. GUN CHARGERS
13. FUEL TANK SELECTOR CONTROL
14. WING-FOLDING CONTROL
15. ENGINE CONTROL QUADRANT
16. CARBURETOR AIR CONTROL
17. COWL FLAP CONTROL
18. FLUORESCENT LIGHT
19. WING-FOLDING SAFETY LATCH
20. IGNITION SWITCH
21. HYDRAULIC BYPASS VALVE
22. CONTROL PEDESTAL-UPPER BANK
23. INSTRUMENT PANEL
24. TORPEDO CONTROL (FUSELAGE BOMB MANUAL RELEASE)
25. RUDDER PEDAL ADJUSTMENT
26. BOMB RELEASE BUTTON
27. WING BOMB MANUAL RELEASE
28. TRIGGER SWITCH
29. CONTROL STICK HANDLE
30. NOSE WHEEL EMERGENCY RELEASE CONTROL

BTD-1 COCKPIT, RIGHT HAND SIDE



1. CONTROL STICK HANDLE
2. RUDDER PEDAL ADJUSTMENT
3. BOMB RELEASE BUTTON
4. RUDDER PEDAL
5. FOOT BRAKE
6. OIL COOLER DOOR POSITION INDICATOR
7. HYDRAULIC HAND PUMP
8. INSTRUMENT PANEL
10. EMERGENCY AIR BRAKE CONTROL
11. AUTOMATIC PILOT CONTROL
12. RECOGNITION RADIO CONTROL BOX
13. FLUORESCENT LIGHT
14. TRANSMITTER CONTROL BOX
15. SLIDING ENCLOSURE CRANK
16. TACTICAL RADIO CONTROL BOX
17. HAND MICROPHONE
18. OXYGEN REGULATOR
19. ARB RECEIVER CONTROL BOX
20. ARB TUNING HEAD
21. JACK BOX
22. OXYGEN MASK
23. RECEIVER CONTROL BOX
24. SHOULDER STRAPS
25. EMERGENCY BOMB DOOR CONTROLS
26. PILOT'S SEAT
27. SEAT STRAPS

JET POWERED "DESTROYER", THE XBTD-2



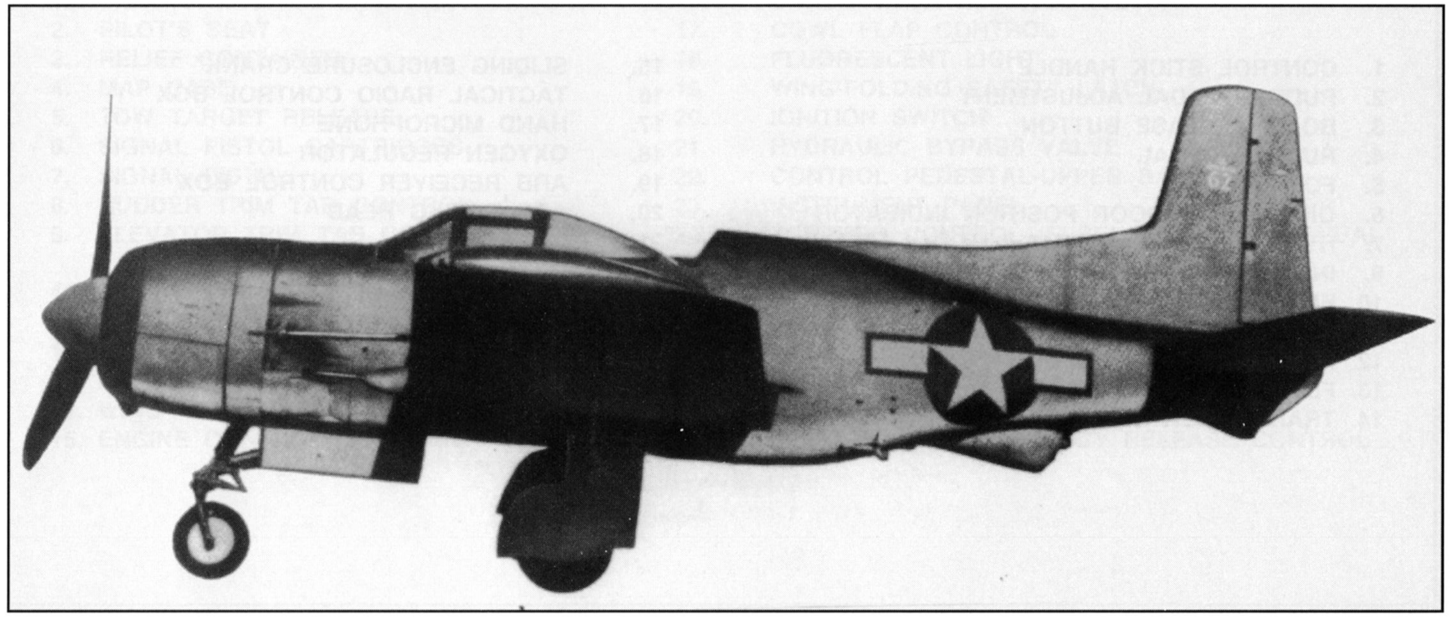
Above, XBTD-2 drawing showing the installation of the WE 19B jet engine and its bomb bay fuel tank.

The XBTD-2 was an attempt by the Navy to quickly utilize the potential of the jet engine by installing it in an existing airframe. Additionally, the BTD-1's tricycle type landing gear, which would help keep the jet's exhaust gases from damaging the carrier's flight deck, could also have been a contributing factor. The allocation of the XBTD-2 BuNos into the first production block of BTD-1s gives a sense of the urgency that the Navy attached to this installation of jet power.

The other similarly-powered naval airplanes were designed from their inception to use both the reciprocating and jet engines. The gas turbine engines of this era were of two types based on the type of compressor used, either a centrifugal or axial type. The J30 axial flow engine, with a 25" diameter, was thinner than the centrifugal flow engines. In comparison, the centrifugal flow J31 was 45" and the J36 was 50" in diameter. Besides being thinner, the axial flow engine benefitted from uninterrupted airflow from its inlet. The larger diameter centrifugal engines were better suited for usage in designs with wing root inlets. What follows is a summary of the jet engines and the composite-powered naval airplanes they were installed in:

MANUFACTURER	MODEL	DES. / COMP.	AIRPLANE
Westinghouse	WE 19	J30, axial	XBTD-2, XTB3F-1
General Electric	I 16	J31, centrifugal	FR-1
Allis-Chalmers	H-1B	J36, centrifugal	XF15Cs, XTB3F-2
Allison	J33-A-19	J33, centrifugal	AJ-1, -2

Below, the jet powered XBTD-2 BuNo 04962 as completed in the tri-colored scheme with a red cowl stripe. (MFR)



The XBTD-2 was powered by the Westinghouse 19B jet engine of 860 lbs of thrust and the Wright R-3350-14. The WE 19B was the follow-on model to the WE 19A, the first jet engine developed for the Navy, which had completed its 100 hour endurance test on 5 July 1943. To create room for the WE 19B, the fuselage fuel tanks were deleted and a bomb bay fuel tank was installed. The lack of a suitable location for the air inlet seems to have been the downfall of the design. The use of wing root air inlets was precluded by the location of the wing fuel tanks, while the bomb bay fuel tank eliminated any use of the lower fuselage for the air inlet. So, in what was probably the least desirable location, the air inlet was installed on the airplane's back, from where the airflow to the compressor took a curved path. Although a centrifugal flow engine would have been the more efficient jet engine for this type of inlet configuration, its greater diameter might have required more space than was available in the XBTD-2. Perhaps in an attempt to shallow-out those curves to increase the efficiency of the axial flow WE 19B, the engine was inclined towards the inlet. That caused its thrust to be canted down from the airplane, diminishing the full benefit of the engine's performance, and would have endangered the wooden flight decks of its day. All of which helps explain why the XBTD-2 has virtually disappeared from the annals of aviation history.

Two XBTD-2s were completed and their dispositions were:

BuNo 04962, "stricken to salvage"
BuNo 04964, "never flown"

BuNo 04963 has been described by some reference sources as being the sole XBTD-2. Since the Navy did order the other airplanes for this jet engine installation in blocks of three, BuNo 04963 may have been planned for jet power at one time. However, the 1945 Douglas Aircraft Modification Activity report does not list 04963 as an XBTD-2.

XBTD-2 pilot's instrument panel. (MFR)

BTD-1 ALLOCATIONS AND USAGES

Deliveries of the BTD-1 started in June 1944 and were completed by October 1945. Since the type was no longer planned for service use, no BTD-1s were assigned to fleet squadrons. A Douglas Aircraft Modification Activity report of 1945 shows the following assigned locations for each airplane:

LOCATION	BuNos.
NAMC Philadelphia	**04959, 09054, 09055, 09057, 09061.**
NACA Moffett Field	**04968, 09059.**
NACA Langley Field	**09058, 09060.**
NPG Dahlgren	**04969.**
NAS Glenview	**09062.**
At Douglas for modification	**09048.**

The location of the 14 remaining BTD-1s was not specified in this report but they are listed as "formally accepted 17 July 1945".

Notes about the locations:

1.) Naval Air Material Center Philadelphia was created on 20 July 1943 and was composed of the following establishments:
A.) Naval Aircraft Factory.
B.) Naval Aircraft Modification Unit.
C.) Naval Air Experimental Station.
D.) Naval Auxiliary Air Station Mustin Field.

All had been facilities of the former Naval Aircraft Factory Organization. On 30 June 1944, NAMU was relocated to Johnsville where "intensified efforts in quantity modifications to service airplanes was available". The factory at Johnsville (PA) was built by the government and used by Brewster for their manufacture of naval aircraft.

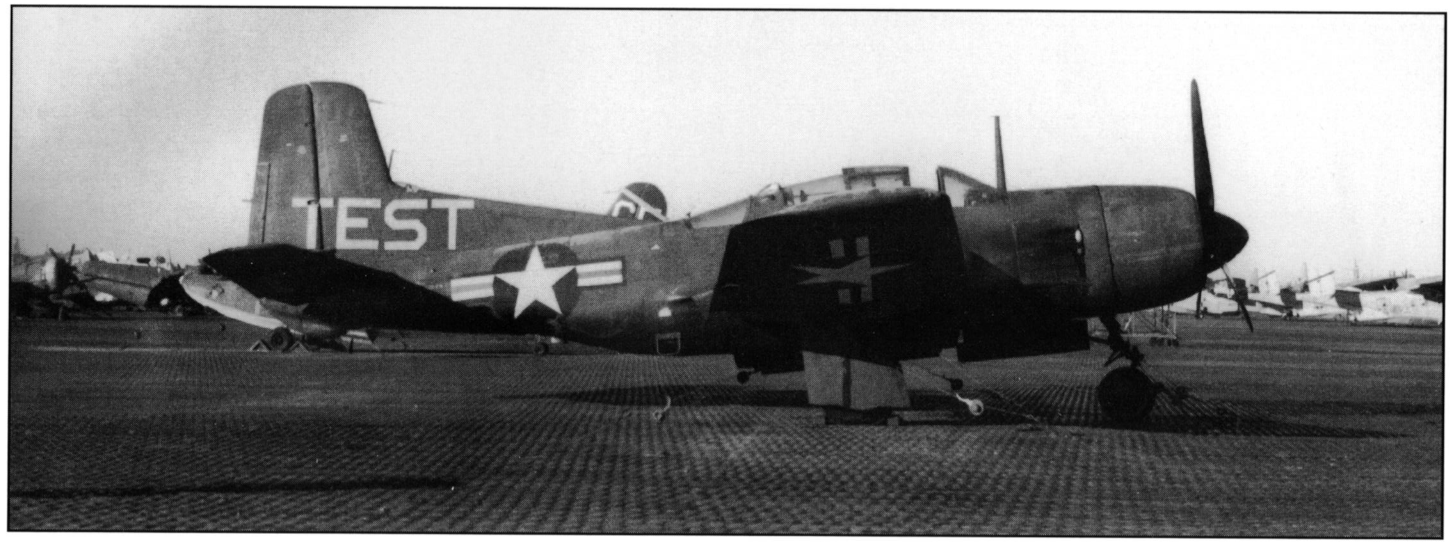
2.) Naval Proving Grounds Dahlgren, VA, was the ordnance testing facility for the Navy. BuNo 04969 could have demonstrated its ordnance compatibility and delivery capabilities there.

3.) Naval Air Test Center was formed at NAS Patuxent River, MD, on 16 June 1945. Several BTD-1s were assigned to both NATC and the Test Pilot School when it was established at Patuxent River.

4.) NACA Moffett took custody of XSB2D-1 03552 on 12 June 1944 which was lost in a crash on 10 January 1946. This was followed by the arrival of BTD-1 04968 on 28 July 1944. This was the BTD-1 that was used for wind tunnel tests in the new 40'X80' tunnel at Ames. Ames subsequently spent more time on the BTD-1 than on any other single aircraft in wind tunnel testing. 04968 was scrapped on 30 June 1947. On 9 October 1944, the other XSB2D-1, BuNo 03551, was acquired and utilized until 24 May 1946. BTD-1 04971

Below, BTD-1 04968 mounted in the 40 by 80 foot wind tunnel at NACA Moffett Field on 9-12-44. It is believed by the public information office at NASA Ames that the BTD-1 was the first full-scale aircraft to be tested in this particular tunnel. (NASA via Harry Gann)

Above, an unknown BTD-1 on 2-18-46. (T. Stone via Lionel Paul)



At right, BTD-1 09059 at NACA Moffett with 4-bladed prop installed. (NACA) Below, BTD-1 04971, which was used for ice research at NACA Moffett. The TEST on the tail was in yellow. (Balogh via Menard)

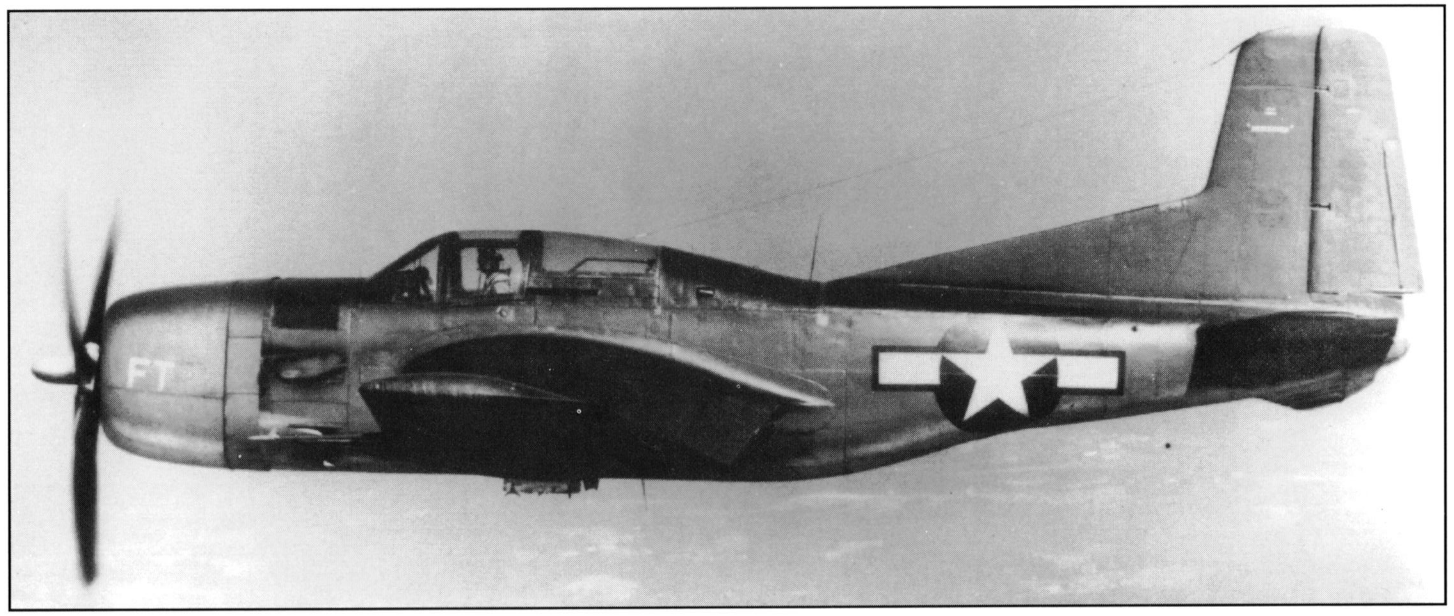
At left, BTD-1 assigned to AEL. (Aeronautics Equipment Laboratory) , a division of the Naval Aircraft Factory, which in turn was part of NAMC. (via Lionel Paul) At left below, BTD-1 04950 assigned to NATC. The "050 NATC" on the bottom of the wing is repeated on the opposite upper wing. "050" is also painted on the fuselage side in front of the national insignia. "NATC" is also painted on the vertical tail. See page 49 for the location of these markings. (via Lionel Paul).

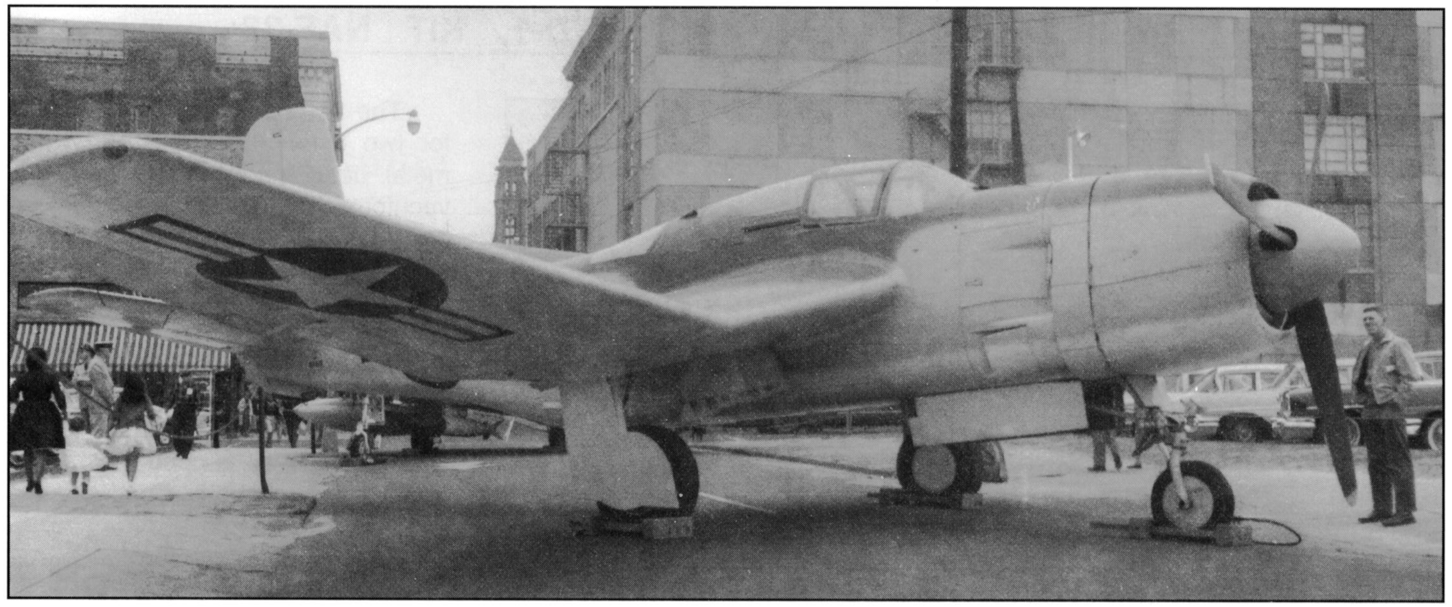
arrived on 18 May 1945, and had a second seat installed and was used for ice research until retirement on 31 October 1947. A final BTD-1, BuNo 09059, was used from 20 July 1945 until 5 November 1947.

5.) NACA Langley received BTD-1 09060 on 27 August 1945 which was used in laboratory tests until 28 November 1946. 09058 was acquired on 8 October 1945 and utilized until 28 November 1946.

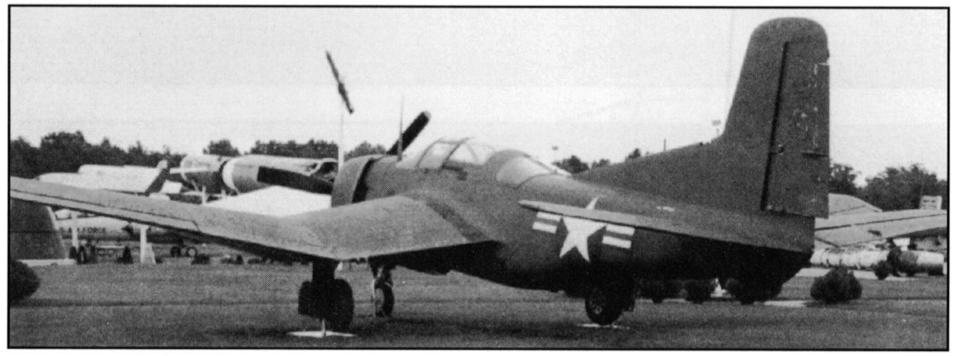
The total production of BTD-1s numbered 26. This total consisted of eleven from the first production block and fifteen from the second block.

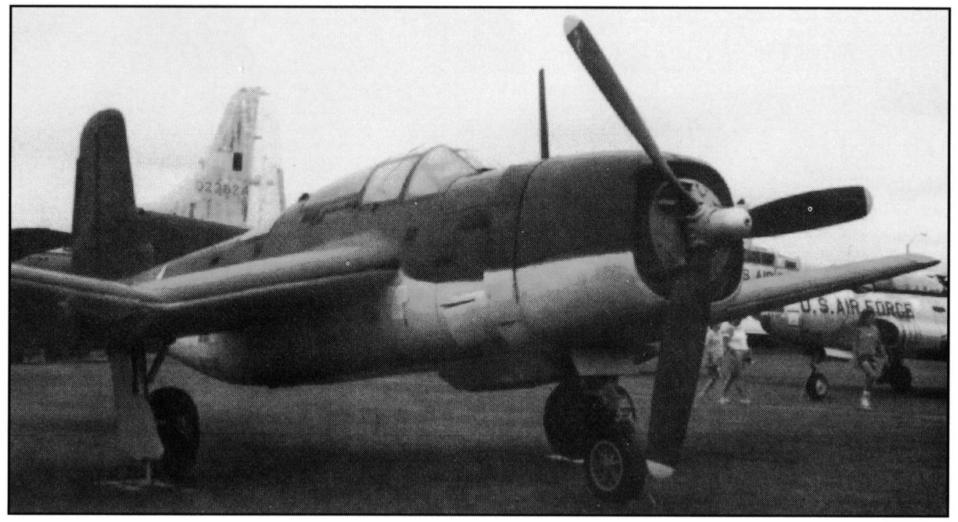
At left and below, two views of BTD-1 04962 assigned to the Naval Air Test Center (NATC) Flight Test (FT) Division on 6-24-44 with a Curtiss 4-blade propeller installed. (USN via Bob Lawson)





BTD-1 04959. Above, in 1958. (Seely via Menard) At right, in 1979. (via Berger) Below, in the mid-80s. (Wayne Morris) Bottom, in bogus paint scheme in August 1987. (R. H. Page)





This second contract was awarded on 31 August 1943 and brought the total of BTD-1 airplanes ordered to 358, two of which were subsequently redesignated as XBTD-2s. However, after the June 1944 meeting that culminated in the design of the XBT2D-1, the BTD-1 was no longer required and its production terminated with just the BTD-1s on the production line being finished.

BTD-1 PRODUCTION SUMMARY:

04959-04961, 04963, 04965-04971, 09048-09062.
09063-09392 cancelled.

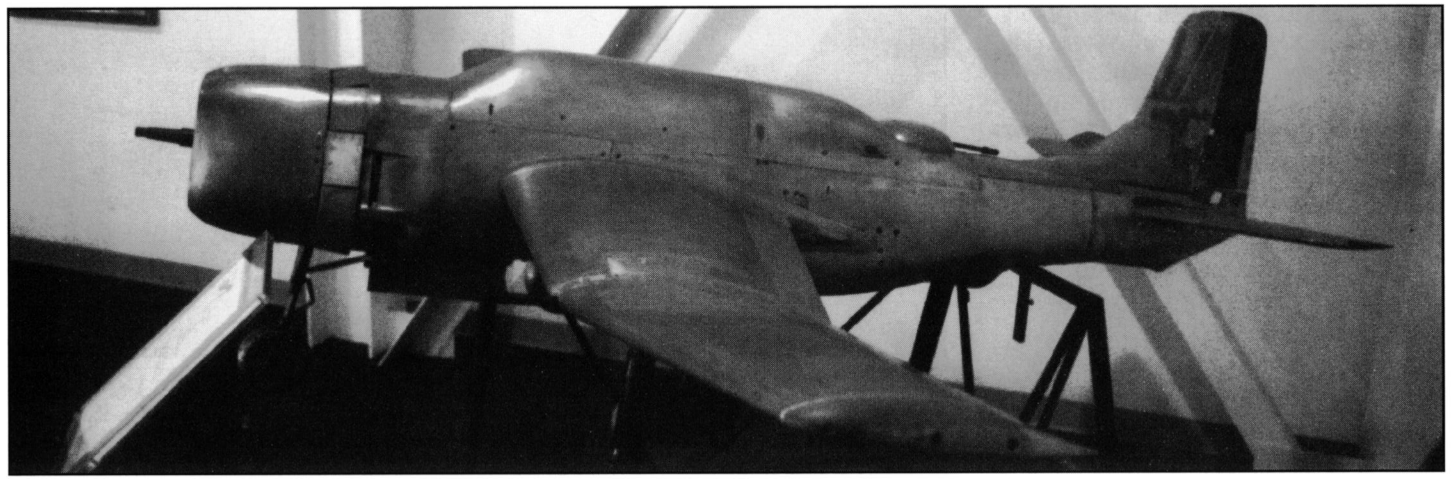
EPILOGUE

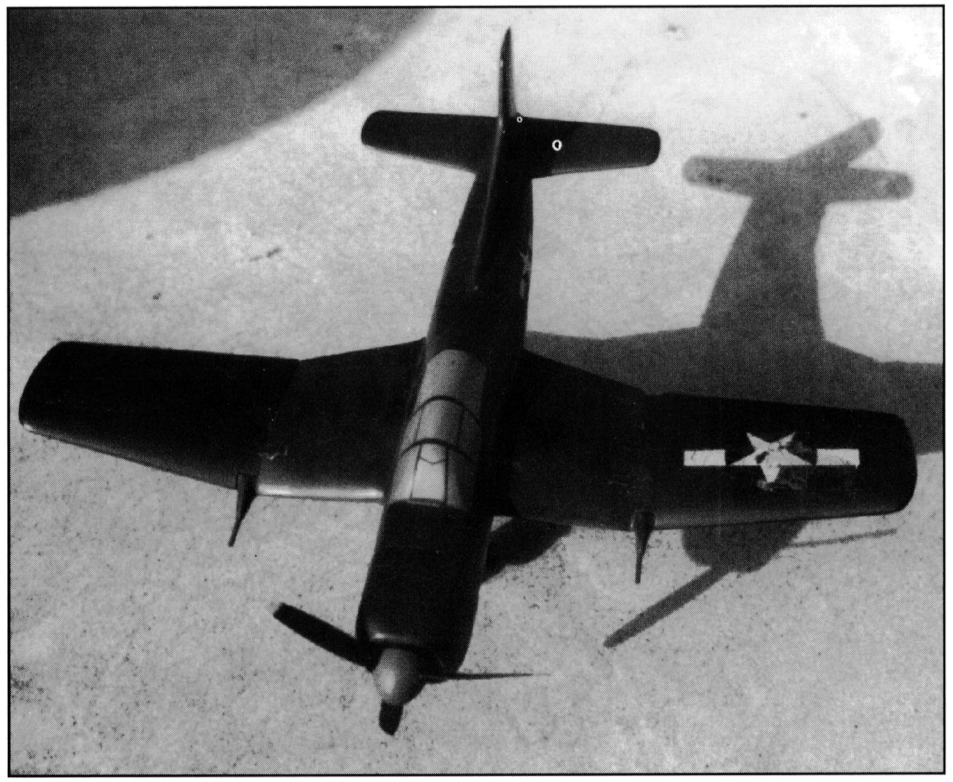
The Douglas XSB2D-1 and its direct descendant, the BTD-1, filled the developmental gap that existed between the pre-war SBD and the post-war AD. By following the development of the XSB2D-1 and BTD-1, we have been able to trace the application of the wartime experiences to the carrier-based dive bomber. The fact that so much of this development is best illustrated by Douglas aircraft shows how well-founded Ed Heinemann's claim was: El Segundo DID build the best dive bombers for the Navy.

THE 1/72 SCALE ESOTERIC BTD-1, KIT NAF-38

The kit comes with good decals for two different aircraft, and white metal detail parts to enhance this vacuform kit. The vacuform pieces are found on two separate plastic sheets. The directions are good and the kit fairly easy to build. A criticism of this kit is that it was made from a flawed set of drawings, which depict the wing size and shape slightly incorrectly and the fuselage not fat enough. All-in-all, a good kit that fills an important nitche in naval aviation history.

1/5 SCALE ALL-METAL DOUGLAS WIND TUNNEL MODEL OF THE XSB2D-1



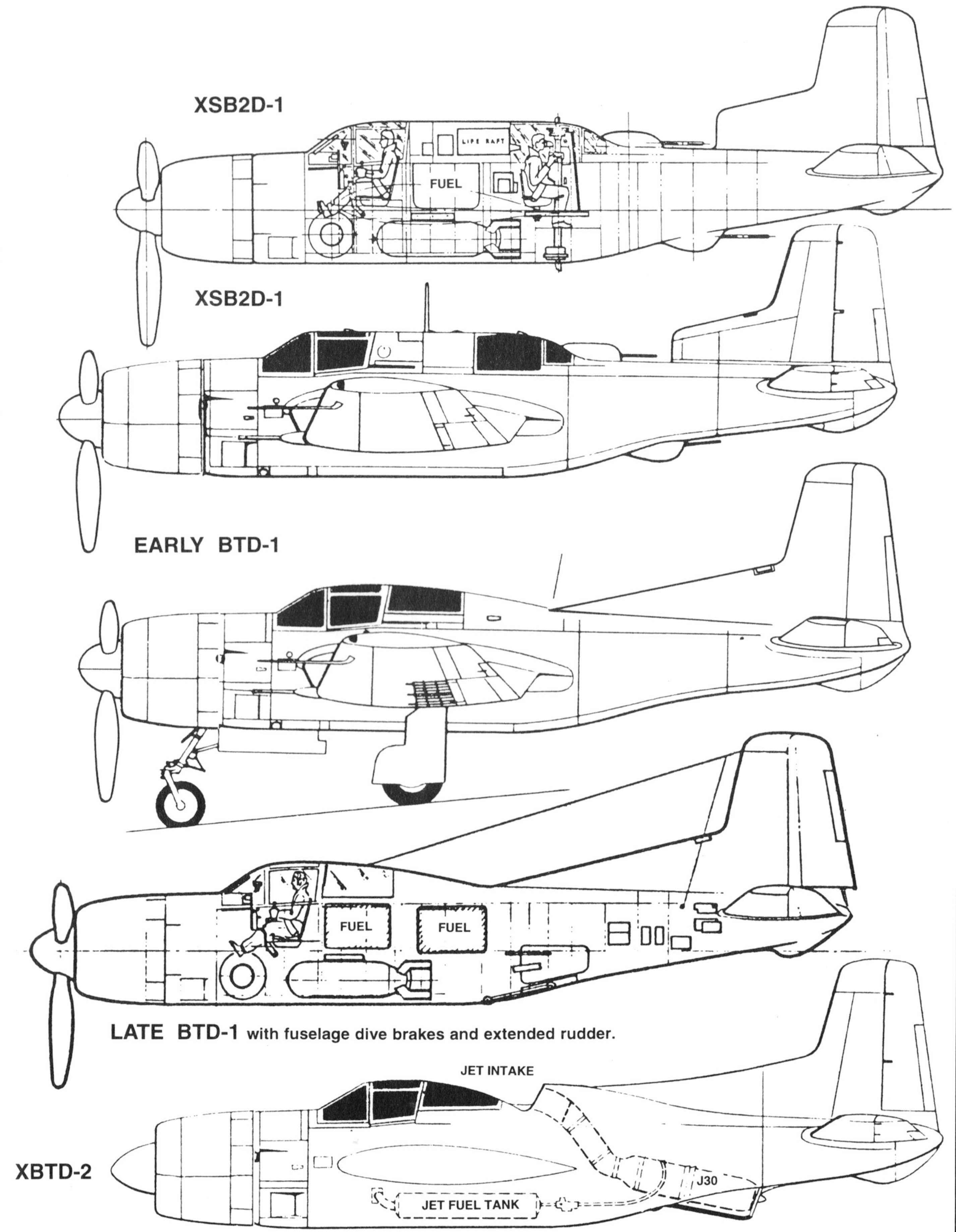


DOUGLAS 1/30 SCALE PRESENTATION MODEL OF THE BTD-1

This all-wood model was built from a specially drawn-up set of blue-prints, which included provisions for folding wings. Two hinges were provided on the tops of both wings to facilitate this wing-folding. (courtesy of Wayne Morris)

1/200 SCALE HBM BTD-1 KIT 203

Stop the press, I just learned of these epoxy resin kits, but have not had time to secue an example for this book. Wright to Ron Crawford, P. O. Box 23, North Ferrisburgh, Vermont, 05473. The kits are inexpensively priced and number 511.



BACK COVER, Douglas drawing of a echelon of BTD-1 Destroyers entering a dive run. (via Harry Gann)